United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the Regents of the University of California (Agricultural Experiment Station) and the California Department of Conservation

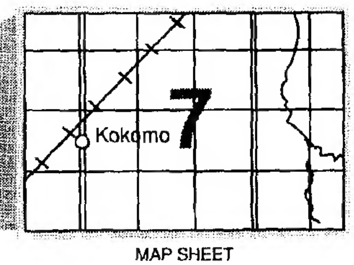
Soil Survey of Stanislaus County, California, Western Part

How To Use This Soil Survey

General Soil Map

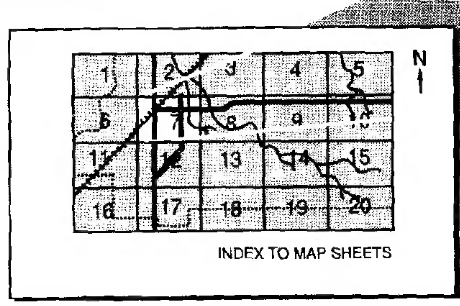
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

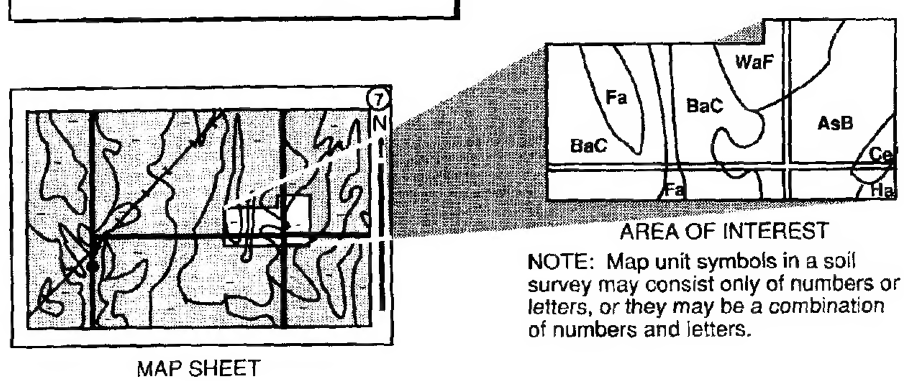


Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

Locate your area of interest on the map sheet. Note the map units symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1996. Soil names and descriptions were approved in 1997. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1997. This survey was made cooperatively by the Natural Resources Conservation Service, the Regents of the University of California (Agricultural Experiment Station), and the California Department of Conservation. The survey is part of the technical assistance furnished to the Western Stanislaus County Resource Conservation District.

Cover: Overview from the Coast Range to the valley showing the diversity in the area.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

Contents

Issued 2002

Foreword

This soil survey contains information that can be used in land-planning programs in the western part of Stanislaus County, California. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify any special practices that may be needed. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally saturated or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or seasonally saturated soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Jeffrey R. Vonk
State Conservationist
Natural Resources Conservation Service

Soil Survey of Stanislaus County, California, Western Part

By Charles A. Ferrari and Michael A. McElhiney

Fieldwork by Charles A. Ferrari, Michael A. McElhiney, Guy J. Romito, Jon P. Schlegal, and Steven E. Slusser

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the
Regents of the University of California (Agricultural Experiment Station) and the
California Department of Conservation

This soil survey updates three older soil survey reports which include portions of the western part of Stanislaus County. These older surveys are the "Reconnaissance Soil Survey of the Lower San Joaquin Valley, California" (USDA, BoS, 1918); the "Soil Survey of the Newman Area, California" (USDA, BoS 1948); and the "Soils of the Westside Stanislaus Area, California" (McLaughlin and Hunington, 1968). The current survey provides additional information and has larger maps, which show the soils in greater detail.

Western Stanislaus County is in the upper San Joaquin Valley in California (figure 1). It has 394,215 acres of land, including small areas of water.

Western Stanislaus County is bounded by San Joaquin County to the north; San Joaquin River to the east; Merced County to the south; Santa Clara County to the west. Elevations range from about 25 feet along the San Joaquin River to about 3,800 in the mountains of the Coast Range, in the western part of the county.

Irrigated cropland, livestock grazing, and urban development are the primary land uses in the survey area.

The descriptions, names, and delineations of the soils on the maps of the survey agree with those areas matching San Joaquin and Merced Counties. However, they do not fully agree with those areas matching Santa Clara County. Differences are the result of a better knowledge of soils, modifications in series concepts, and variations in the intensity of mapping or in the extent of the soils within the survey areas.

General Nature of the Survey Area

The following paragraphs give general information about western Stanislaus County. They describe history and development; the water supply; agriculture development; physiography, relief, and drainage; vegetation; and climate.

History and Development

In the early 1840's, of several Mexican land grants made in San Joaquin Valley, three were very important with respect to the settlement of the area. They were known as El Pescadero in the northern part and extending northward into San Joaquin County, Rancho Del Puerto in the central part, and Orestimba Rancho in the southern part, extending southward outside the county. The holders of these grants had a few cattle but did little or no farming.

In 1849 a party of men built a ferry to cross the San Joaquin River at Grayson, and shortly afterward Jesse Hill built one at Hills Ferry. These two places grew to small settlements and were stagecoach stops on a route connecting with Banta in San Joaquin County. Isaac Crow came to this section about 1850 and he and several brothers located on the San Joaquin River near the mouth of Orestimba Creek, where they found excellent pasture for their sheep, cattle, and mules.

Early in the 1850's the Mexican land grants were purchased by incoming settlers, who began raising cattle and sheep. The sheep were herded after a fashion but the cattle roamed the plains and hills from Tulare Lake to Antioch. At periodic roundups the young

Figure 1.—Location of the survey area in California.

livestock were branded and returned to the range. The cattle were raised mostly for hides and tallow but soon a ready market for meat developed in the mining camps of the Sierra Nevada foothills.

In 1888 the town of Newman was founded and named in honor of Simon Newman, who was the leading merchant of Hills Ferry and was influential in having the railroad extended from Tracy in San Joaquin County. With the advent of the railroad, the town of Hills Ferry was moved to Newman.

The people north of the canal continued growing dry-farmed grain until about 1909, when the Patterson Colony was organized and the town of Patterson was founded. This colonization was promoted by the heirs of John D. Patterson, who obtained most of the land in the Mexican grant of Rancho del Puerto. A tract of about 19,000 acres was subdivided into parcels of about 30 acres, with roadways laid out at half-mile intervals.

The first purchasers of land in the colony were mostly Scandinavians from the Midwest, some of whom are still on their holding, though many were unable to farm this land successfully, as most of the holdings were too small to support a family. In many instances two or three turnovers have been made and at present most of the units contain 40 to 60 acres. Water rights were sold with the land, and definite water assessments are charged to each acre within the district. Dairying and fruit farming are the principal enterprises within the Patterson Colony, with small acreages planted to beans and other field crops, but alfalfa is grown on the larger farms.

Water Supply

In the 1860's, with the increase in grain farming, waterborne traffic was developed and grain was transported to market by steamboats on the San Joaquin River. Grayson and Hills Ferry became important towns along the river. The high-water period of the San Joaquin, from the latter part of May to early in June, brought about by melting snow in the high Sierras, followed so closely the grain harvest season that is was often difficult to get the grain shipped by boat before navigation became dangerous.

In 1876, Henry Miller, who then owned large holdings in that section, built a canal from Mendota in Fresno County to Los Banos in Merced County, and a year or two later extended it a few miles north of Orestimba Creek. The canal was projected mainly for transportation, but it was used for irrigation, which was begun about that time. At present, it is still used for irrigation purposes and furnishes water to lands below its ditch from Mendota to Crows Landing.

In 1920, the West Stanislaus Irrigation District was organized. The first water deliveries were made in 1929. This gave West Stanislaus the right to appropriate up to 262 cubic feet per second of water each year from the San Joaquin River. Since 1929, diversions have increased from 12,000 acre-feet to a maximum of 113,000 acre-feet in 1984.

The water is conveyed through an unlined gravity canal to the district's first pumping plant, where the water is lifted approximately 35 feet into a concrete-lined main canal, where the water flows by gravity to the next pumping plant. A total of six pumping plants in the main canal successively lift the diverted water to an elevation of 165 feet above sea level. Water is diverted from the main canal into lateral canals that run north and south.

The district also diverts water from White Lake Mutual Water Company under an agreement entered into in 1928. The area irrigated by this water is 2,202 acres.

After the construction of Friant Dam and the diversion of San Joaquin River water into the southern part of the valley, the quantity of water available to downstream users in most years was less than adequate and the quality was becoming more saline. Due to these problems and the drought in the late 1940's, the district looked to the Central Valley Project (CVP) for a supplemental source.

The district signed a contract with CVP in 1953 for 20,000 acre-feet and has used up to 66,000 acre-feet. However, in the drought of 1977 the district's allocated water supply was reduced by 25 percent. As a result of this, the district drilled four ground-water wells to supplement their other sources. Use of the wells is limited because of the high pumping costs and water quality (USDI, 1996).

Agriculture Development

The present cropping pattern of the area reflects economic changes in the value of crops from grain to field crops to vegetables and eventually to permanent orchard crops. The acreage along the western edge of the area is mostly rangeland. Some of the dissected terraces have been converted to young orchards.

Most of the furrow irrigated row and field crops are grown in 2- to-8 year double-cropped rotations. Tomatoes are the leader of the vegetable crops since they are a high income crop. At any given time, 25 percent of the row and field crop acreage in the area are in alfalfa.

The summer crops include green lima beans, tomatoes, dry baby limas, melons, honeydews, sugar beets, alfalfa, and corn silage. The winter crops are cauliflower, peas, sugar beets, winter oats, oat silage, and alfalfa (USDI, 1996).

Field, fruit, nut, and vegetable crops are the leading agricultural commodities, closely followed by livestock and poultry products, which are consistently among the top 10 commodities in the county.

Looking at the early history and highlighting major crops grown in the 1940's may shed some light on cropping history.

Grain growing was important crop during the 1860's and resulted in establishing many claims and homesteads. Grain farmers were continually having trouble with livestock owners because neither farms nor the range were fenced. In 1870 the State of California passed a law requiring owners either to fence in their livestock or to pay damages to farmers for their crops injured. This law was in effect from northern California to the Calaveras River, and in 1873 was extended to include Stanislaus and Merced Counties, which greatly expanded grain farming.

By the mid 1930's and 1940's the area had a great variety of production of crops and livestock.

The acreage planted to beans steadily increased since the 1920's until beans were one of the most extensively cultivated crops in the area. In 1939 the Federal census of Stanislaus County showed a total of 35,448 acres. Much of this was in baby limas, with the rest divided between black-eyed, pinto, and red kidney beans.

The beans were usually harvested as dried beans late in fall and put in warehouses for shipment to Midwestern or Eastern markets when prices were favorable. Additional revenue was obtained each year after harvesting from the rental of fields for sheep pasture. The straw and beans left on the ground by the thresher make excellent feed.

No fertilizer was used on the crop, and many fields were planted to beans every year for more than 10 years with no apparent reduction of yields. Occasionally some operators would plant the beans following a winter crop of peas. This practice met with varying success, but in general the pea crop was only fair and hardly worth the cost of planting and the risk of loss.

Grain was a very important and profitable crop. The grain most extensively grown was barley, 60,072 acres of which were planted in 1939, according to the Federal census of Stanislaus County. Wheat, grain sorghum, and oats were the next most important grains, in the order named, but the total acreage was small.

With the exception of grain sorghum, which was grown in small irrigated plots, grains were dry-farmed in large tracts on broad alluvial fans and low terraces. A general practice of planting in fall on summer-fallowed land was followed by harvesting late in spring. On the steeper slopes and high terraces, where the soils were less productive, a 3-year rotation was sometimes practiced, consisting of planting and harvesting the first year, harvesting a volunteer crop the second, and pasturing the third. The fields were later pastured to sheep, which clean up the grain left by the combine harvester. The remaining stubble and straw was burned because the rainfall was relatively low and the straw will not decompose by the time tillage and planting operations begin in fall.

Most of the grain hay produced was consumed locally; the grain was shipped to State and interstate markets.

Alfalfa, an extensively grown crop, had an acreage of 67,644 in the county in 1939. Despite this large acreage, it was raised primarily for the extensive dairying enterprises of the west side of the valley, and little if any was sold outside of the county.

Practically all the crop was grown on the flat valley bottoms and was irrigated either by the contour or the border-check method.

Generally, the yield and quality of the alfalfa were not good, primarily because this crop was incidental to the major enterprise of dairying.

Some former alfalfa fields were being replanted to sudangrass and ladino clover, which seem to grow very well on the heavier soils less well adapted to alfalfa. These crops were high in nutrient value and easy to handle.

Raising flaxseed was a very new enterprise in the county. In 1939, 616 acres was used for this crop, mostly in the northern half of the Newman area. Flax is a shallow-rooted crop and can be grown successfully on soils that are heavier and not well adapted to alfalfa or beans. Good prices and a ready market prevailed in the San Francisco Bay area.

Birdseed, rice, corn, and cotton were planted in small acreages, aggregating about 1,500 acres each year.

Peas were planted in fall and harvested in spring. Some of the crop was dried and sold locally for seed, but most of the fresh peas were sold to canneries or local vegetable markets. The yield and quality were only fair compared to other communities, and the uncertainty of market prices tends to discourage too large an investment.

Celery has been raised successfully and may become increasingly important. It was essentially a specialty crop.

Lettuce was probably the next most important truck crop grown and was frequently rotated with celery. It was planted late in August and harvested in November and December.

Small acreages varying in size from year to year were planted to melons, onions, and tomatoes. On the average, good yields were obtained, but larger areas elsewhere in California were better suited to these crops. Uncertain market conditions and a relatively high cost of production tended to confine the cultivation of specialty crops to areas where the climate is most favorable.

In 1940, 70 farms reported a total of 271,242 grapevines of bearing age in Newman and Patterson Townships. About two-thirds of them were Thompson Seedless and one-third Carignane. There was a large reduction in vineyard acreage largely because investigations showed that the Sultanina (Thompson Seedless) variety was not especially well suited to the climate; the wide variation between night and day temperatures resulted in reducing the sugar content. The Carignane variety, however, used in wine making, was somewhat better adapted to the area.

The census figures for Newman and Patterson Townships showed a total of 3,515 acres in bearing and nonbearing fruit orchards, vineyards, and planted nut trees on April 1, 1940. About 80 percent of this acreage was in the northern half of the area.

Apricots were the most extensively cultivated orchard crop, the Tilton variety dominating. In a large acreage of bearing trees in the vicinity of Patterson the trees were well adapted to the soil and climate and the enterprise was profitable when market prices were favorable.

A total of 87,362 peach trees of bearing age was reported in the 1940 census for Newman and Patterson Townships. A number of varieties were grown, but none seem to be more than fairy successful. Neither the soil nor the climate favors this crop particularly well.

Walnuts were probably the next most important tree crop. The groves were small and fairly well scattered.

About 100 acres was used for almonds, divided about equally between the hard-shell Texas and the soft-shell Nonpareil.

The dairy industry probably contributed more income than any other single enterprise to the inhabitants living in the area. The valley bottom area between Crows Landing and Newman was believed to have a greater number of cows to the acre than any other dairying community in the United States. On April 1, 1940, 226 farms in Newman Township reported 9,140 cows and heifers kept for milk production, and in Patterson Township 250 farms reported 5,435. The total number of cattle over 3 months old was 13,013 and 7,884 in Newman and Patterson Townships, respectively.

Very little liquid milk was sold to the markets from these dairies. It was produced mainly for butter, cheese, condensed milk, and other by-products. A large milk-condensing plant was at Patterson and a condensing plant and creamery at Newman. Butterfat prices paid by creameries were based on San Francisco milk quotations.

In 1939, 25,242 acres was in pasture in Newman and Patterson Townships.

Practically all the beef cattle were Hereford and raised for California markets. It was possible to finish most of the cattle on the range, but some were shipped to outside markets as feeders. Sheep also were pastured on grain stubble and bean straw in the valley. California markets consumed most of the lambs and wool.

Swine was another livestock enterprise of some importance. On April 1, 1940, 40 farms reported 246 swine over 4 months old in the two townships. According to the 1940 census 59,503 chickens and 18,038 turkeys where raised in 1939.

The projected crop pattern for irrigated lands will be almost exclusively row and field crops, orchards, and a few vineyards. Urbanization of cropland is anticipated

within the area adjacent to the city of Patterson along the eastern edge of the area. Isolated pockets along the Interstate 5 Highway corridor will also increase in urban growth (USDI, 1996).

Physiography

"The area consists of three parallel natural physiographic divisions: (1) The mountainous and foothill areas to the west; (2) a broad central valley plain consisting of smooth confluent alluvial fans built-up by small streams flowing from the hills on the west; and (3) the narrow flood plain of the San Joaquin River on the east" (USDA, BoS, 1938).

Vegetation

"Native vegetation occurs principally in the hills and mountains of the western part of the area. In general there was a zone of grassland just above the valley floor and on the low rolling foothills of the Diablo Range. Farther west and on the higher and steeper slopes the grassland gives way to woodland-grass or brush associations" (USDA, BoS, 1938).

Climate

The climate of Western Stanislaus County is characterized by hot, dry summers and cool, moist winters. The Coast Range moderates the effects of the moisture-laden weather systems from the Pacific Ocean. Summers were hot and dry because a persistent high-pressure area offshore keeps most weather systems from entering the area. A southward shift of the high-pressure area in winter allows weather systems to enter the area, producing cool, moist weather and frequent fogs.

Climate tables are created from climate stations Newman (elevation 90 feet) and Mt. Hamilton (elevation 4210 feet), California. Mt. Hamilton is just across the westernmost, ridgetop border in Santa Clara county.

Thunderstorm days, relative humidity, percent sunshine, and wind information are estimated from First Order stations Fresno and Stockton, California.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Newman in the period 1961 to 1990. Daily extremes were extracted from the full period of record for each station. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

At Newman, in winter, the average temperature is 47.0 degrees F. and the average daily minimum temperature is 36.7 degrees. The lowest temperature on record, which occurred at Newman on December 23, 1990, is 15 degrees. In summer, the average temperature is 75.7 degrees and the average daily maximum temperature is 94.1 degrees. The highest temperature, which occurred at Newman on July 3, 1950, is 115 degrees.

At Mt. Hamilton, in winter, the average temperature is 43.6 degrees F and the average daily minimum temperature is 37.4 degrees. The lowest temperature on record, which occurred at Mt. Hamilton on December 21, 1990, is 7 degrees. In summer, the average temperature is 68.5 degrees and the average daily maximum temperature is 76.7 degrees. The highest temperature, which occurred at Mt. Hamilton on August 5, 1978, is 103 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units". During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

At Newman, the total annual precipitation is about 10.53 inches. Of this, about 1.90 inches, or 18 percent, usually falls in April through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 4.10 inches at Newman on January 17, 1988. Thunderstorms occur on about 4 days each year, and can occur in any month.

At Mt. Hamilton, the total annual precipitation is about 20.76 inches. Of this, about 4.45 inches, or 21 percent, usually falls in April through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.87 inches at Mt. Hamilton on December 23, 1955. Thunderstorms occur on about 4 days each year, and can occur in any month.

No significant snowfall has been recorded in lower elevations of West Stanislaus county. However, at higher elevations in the mountains of the westernmost part of the county snow falls nearly every winter. At Mt. Hamilton, there is an average of 8 days per year with at least one inch of snow on the ground. The average seasonal snowfall at Mt. Hamilton is 14.5 inches. The greatest snow depth at Mt. Hamilton was 24 inches recorded on December 17, 1970. The greatest one day snowfall at Mt. Hamilton was 16.0 inches on April 10, 1965.

The average relative humidity in mid-afternoon is about 43 percent. Humidity is higher at night, and the average at dawn is about 78 percent. The sun shines

92 percent of the time in summer and 50 percent in winter. The prevailing wind is from the west northwest. Average windspeed is highest, 9.0 miles per hour, in June.

Figure 2 shows an accumulation of rainfall information since 1932. The average precipitation is about 10 inches. Notice the increase in the highest rainfall years. These years also correspond to the flooding events in the valley areas.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually

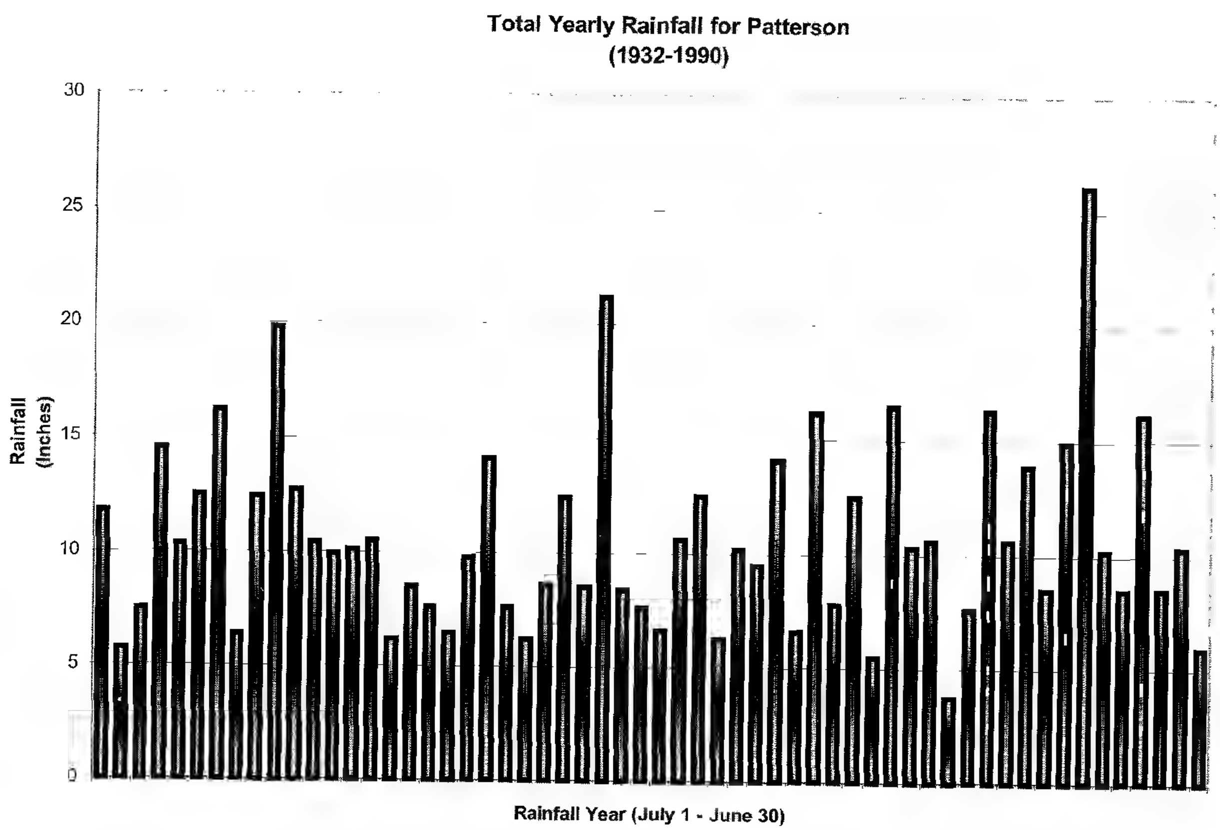


Figure 2.—Over 50 years of total rainfall data collected in Patterson. The high rainfall years are responsible for the soil forming factors in the area.

change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Soil Map Units

The general soil map included in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Columbia-Merritt-Xerofluvents Association

Very deep, nearly level, poorly drained and somewhat poorly drained soils formed in alluvium from sedimentary and mixed rock sources; on flood plains adjacent to the San Joaquin River

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Composition

Extent of the association: 3 percent of the survey area
Extent of the soils in the association:
Columbia soils—40 percent
Merritt soils—13 percent
Xerofluvents—12 percent
Minor soils—22 percent

Soil Properties and Qualities

Columbia

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on landform: Flood plains
Parent material: Alluvium from mixed rock sources
Surface textural class: Fine sandy loam
Slope: Nearly level

Merritt

Depth class: Very deep
Drainage class: Poorly drained
Position on landform: Flood plains
Parent material: Alluvium from sedimentary rock sources
Surface textural class: Silty clay loam
Slope: Nearly level

Xerofluvents

Depth class: Very deep
Drainage class: Somewhat excessively drained
Position on landform: Flood plains
Parent material: Alluvium dominantly from mixed rock sources
Surface textural class: Very gravelly loam and gravelly sandy loam
Slope: Nearly level to gently sloping

Minor Soils

- Clear Lake soils in basins
- Dello and Dospalos soils on similar positions
- Veritas soils on low fan terraces

Use and Management

Major uses: Irrigated crops and homesite development

Management concerns: High water table, flooding, and rapid permeability in a sandy substratum

Management measures: Maintaining drainage system, flood protection, and control of seepage of contaminants

2. Pedcat

Very deep, nearly level, poorly drained soils formed in alluvium from sedimentary rock sources; in the southeastern area adjacent to the San Joaquin River

Setting

Landform: Low alluvial fans
Slope range: 0 to 2 percent

Composition

Extent of the association: 1 percent of the survey area
Extent of the soils in the association:
Pedcat soils—84 percent
Minor soils—16 percent

Soil Properties and Qualities

Pedcat

Depth class: Very deep
Drainage class: Poorly drained
Position on landform: Low alluvial fans
Parent material: Alluvium from sedimentary rock sources
Surface textural class: Clay loam
Slope: Nearly level

Minor Soils

- Clear Lake soils in basins

Use and Management

Major uses: Irrigated crops and homesite development

Management concerns: Flooding, saline-sodic conditions, restricted permeability, shrink-swell, low strength, and high water table

Management measures: Water management, foundation and waste management structure design and saline-sodic management and plant selection

3. Dospalos-Dosamigos Association

Very deep, nearly level, poorly drained and somewhat poorly drained soils formed in alluvium from granitic and sedimentary rock sources; on low alluvial fans and flood plains in the southern area

Setting

Landform: Low alluvial fans and flood plains
Slope range: 0 to 2 percent

Composition

Extent of the association: Less than 1 percent of the survey area
Extent of the soils in the association:
Dospalos soils—46 percent
Dosamigos soils—28 percent
Minor soils—26 percent

Soil Properties and Qualities

Dospalos

Depth class: Very deep
Drainage class: Poorly drained
Position on landform: Flood plains
Parent material: Alluvium from granitic rock sources
Surface textural class: Clay loam, clay
Slope: Nearly level

Dosamigos

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on landform: Low alluvial fans
Parent material: Alluvium from sedimentary rock sources
Surface textural class: Clay loam
Slope: Nearly level

Minor Soils

- Deldota soils on low alluvial fans

Use and Management

Major uses: Irrigated crops and homesite development

Management concerns: Restricted permeability, flooding, high water table, fine surface texture, shrink-swell, low strength, and saline-sodic conditions in the Dosamigos soils

Management measures: Water management, foundation and waste management structure design and saline-sodic plant selection

4. Capay

Very deep, nearly level, moderately well drained soils formed in alluvium from sandstone and shale rock sources; in interfan basins in the northern and central part of the area

Setting

Landform: Interfan basin

Slope range: 0 to 2 percent

Composition

Extent of the association: 3 percent of the survey area
Extent of the soils in the association:
Capay soils—100 percent

Soil Properties and Qualities

Capay

Depth class: Very deep
Drainage class: Moderately well drained
Position on landform: Interfan basin
Parent material: Alluvium from sandstone and shale rock sources
Surface textural class: Clay
Slope: Nearly level

Use and Management

Major uses: Irrigated crops and homesite development

Management concerns: Restricted permeability, shrink-swell, low strength, flooding

Management measures: Water management, and foundation and waste management structure design

5. Capay-El Solyo-Vernalis Association

Very deep, nearly level, moderately well drained and well drained soils that are subject to artificial wetness and formed in alluvium from sandstone, shale, sedimentary, metamorphic, and mixed rock sources; in interfan basins and on low alluvial fans in the northeastern and southeastern area

Setting

Landform: interfan basins and on low alluvial fans
Slope range: 0 to 2 percent

Composition

Extent of the association: 7 percent of the survey area
Extent of the soils in the association:
Capay soils—47 percent
El Solyo soils—21 percent
Vernalis soils—18 percent
Minor soils—14 percent

Soil Properties and Qualities

Capay

Depth class: Very deep
Drainage class: Moderately well drained
Position on landform: Interfan basins
Parent material: Alluvium from sandstone and shale rock sources
Surface textural class: Clay
Slope: Nearly level

El Solyo

Depth class: Very deep
Drainage class: Well drained
Position on landform: Low alluvial fans
Parent material: Alluvium from sedimentary and metamorphic rock sources
Surface textural class: Silty clay loam or clay loam
Slope: Nearly level

Vernalis

Depth class: Very deep
Drainage class: Well drained
Position on landform: Low alluvial fans
Parent material: Alluvium from mixed rock sources
Surface textural class: Clay loam or loam
Slope: Nearly level

Minor Soils

- Elsalado soils on similar positions
- Zacharias soils on alluvial fans and low stream terraces

Use and Management

Major uses: Irrigated crops and homesite development

Management concerns: High water table, restricted permeability, shrink-swell, low strength

Management measures: Maintaining drainage system, foundation and waste management structure design

6. Vernalis-Zacharias-Elsalado Association

Very deep, well drained soils formed in alluvium from mixed rock sources and from sandstone and shale; on alluvial fans and low stream terraces in the eastern part of the area between the San Joaquin River and Interstate 5

Setting

Landform: Alluvial fans and low stream terraces
Slope range: 0 to 2 percent

Composition

Extent of the association: 13 percent of the survey area

Extent of the soils in the association:
Vernalis soils—51 percent
Zacharias soils—34 percent
Elsalado soils—14 percent
Minor soils—1 percent

Soil Properties and Qualities

Vernalis

Depth class: Very deep
Drainage class: Well drained
Position on landform: Alluvial fans
Parent material: Alluvium from mixed rock sources
Surface textural class: Clay loam or loam
Slope: Nearly level

Zacharias

Depth class: Very deep
Drainage class: Well drained
Position on landform: Alluvial fans and low stream terraces
Parent material: Alluvium from mixed rock sources
Surface textural class: Clay loam or gravelly clay loam
Slope: Nearly level

Elsalado

Depth class: Very deep
Drainage class: Well drained
Position on landform: Alluvial fans
Parent material: Alluvium from sandstone and shale rock sources
Surface textural class: Loam or fine sandy loam
Slope: Nearly level

Minor Soils

- El Solyo soils on low alluvial fans

Use and Management

Major uses: Irrigated crops and homesite development

Management concerns: Few concerns for irrigated crops; restricted permeability, shrink-swell, low strength for homesite development

Management measures: Foundation and waste management structure design

7. Zacharias-Stomar Association

Very deep, nearly level, well drained soils formed in mixed and sedimentary rock sources; on the slightly higher alluvial fans in the northwestern to southwestern area

Setting

Landform: Alluvial fans
Slope range: 0 to 2 percent

Composition

Extent of the association: 5 percent of the survey area
Extent of the soils in the association:
Zacharias soils—43 percent
Stomar soils—40 percent
Minor soils—17 percent

Soil Properties and Qualities

Zacharias

Depth class: Very deep
Drainage class: Well drained
Position on landform: Slightly higher alluvial fans
Parent material: Alluvium from mixed rock sources
Surface textural class: Clay loam or gravelly clay loam
Slope: Nearly level

Stomar

Depth class: Very deep
Drainage class: Well drained
Position on landform: Dissected alluvial fans
Parent material: Alluvium from sedimentary rock sources
Surface textural class: Clay loam
Slope: Nearly level

Minor Soils

- Cortina soils on slightly lower positions
- Yokut soils on similar positions

Use and Management

Major uses: Irrigated crops and homesite development

Management concerns: Restricted permeability, shrink-swell, low strength

Management measures: Water management, and foundation and waste management structure design

8. Damluis

Very deep, nearly level to rolling, well drained soils formed in alluvium from mixed rock sources; on low or uplifted terraces

Setting

Landform: Low or uplifted terraces
Slope range: 0 to 15 percent

Composition

Extent of the association: 4 percent of the survey area
Extent of the soils in the association:
Damlius soils—63 percent
Minor soils—27 percent

Soil Properties and Qualities

Damluis

Depth class: Very deep
Drainage class: Well drained
Position on landform: Low or uplifted terraces
Parent material: Alluvium from mixed rock sources
Surface textural class: Clay loam or gravelly clay loam
Slope: Nearly level to rolling

Minor Soils

- Carranza and Woo soils on alluvial fans
- Calla and Carbona soils on similar positions
- Chaqua soils on sideslopes of uplifted dissected terraces and foothills
- Oquin soils low foothills
- Arburua and Ayar soils on foothills

Use and Management

Major uses: Irrigated crops, livestock grazing, and homesite development

Management concerns: Erosion hazard, slope, restricted permeability, shrink-swell, low strength

Management measures: Erosion control, contour farming, foundation and waste management structure design

9. Carbona-Calla Association

Very deep, undulating to steep, well drained soils formed in alluvium from mixed rock sources and in calcareous alluvium from sedimentary rock sources; on uplifted dissected terraces in the southwestern area (figure 3)

Setting

Landform: Uplifted dissected terraces
Slope range: 2 to 50 percent

Composition

Extent of the association: 2 percent of the survey area
Extent of the soils in the association:
Carbona soils—42 percent
Calla soils—24 percent
Minor soils—34 percent

Soil Properties and Qualities

Carbona

Depth class: Very deep
Drainage class: Well drained
Position on landform: Uplifted dissected terraces
Parent material: Alluvium from mixed rock sources
Surface textural class: Clay loam
Slope: Undulating to steep

Calla

Depth class: Very deep
Drainage class: Well drained
Position on landform: Uplifted dissected terraces
Parent material: Calcareous alluvium from sedimentary rock sources
Surface textural class: Clay loam
Slope: Steep

Minor Soils

- Xerofluvents on flood plains
- Orognen soils on similar positions

Use and Management

Major uses: Livestock grazing

Management concerns: Erosion hazard, slope

Management measures: Controlled grazing

10. Wisflat-Arburua-Rock outcrop Association

Moderately deep to shallow, gently rolling to very steep, well drained soils formed in calcareous and noncalcareous sandstone; on mountains in the southwestern area

Setting

Landform: Mountains
Slope range: 5 to 75 percent

Composition

Extent of the association: 31 percent of the survey area
Extent of the soils in the association:
Wisflat soils—33 percent
Arburua soils—23 percent
Rock outcrop—12 percent
Minor soils—32 percent

Soil Properties and Qualities

Wisflat

Depth class: Shallow

Drainage class: Well drained
Position on landform: Mountains
Parent material: Sandstone
Surface textural class: Sandy loam
Slope: Rolling to very steep

Arburua

Depth class: Moderately deep
Drainage class: Well drained
Position on landform: Mountains
Parent material: Calcareous sandstone
Surface textural class: Loam
Slope: Gently rolling to very steep

Minor Soils

- Oneil soils on foothills
- Alo, Contra Costa, Quinto, San Timoteo, Sehorn, Stonyford, and Vaquero soils on mountains

Use and Management

Major uses: Livestock grazing

Management concerns: Available water capacity, erosion hazard, and slope

Management measures: Controlled grazing

11. Honker-Gaviota-Gonzaga Association

Moderately deep to shallow, steep to very steep, well drained soils formed in sandstone and shale; on mountains in the southwestern area (figure 3)

Setting

Landform: Mountains
Slope range: 30 to 75 percent

Composition

Extent of the association: 28 percent of the survey area
Extent of the soils in the association:
Honker soils—33 percent
Gaviota soils—19 percent
Gonzaga soils—16 percent
Minor soils—32 percent

Soil Properties and Qualities

Honker

Depth class: Moderately deep
Drainage class: Well drained
Position on landform: Mountains
Parent material: Sandstone
Surface textural class: Sandy loam, gravelly loam
Slope: Steep to very steep

Gaviota (figure 4)

Depth class: Shallow
Drainage class: Well drained
Position on landform: Mountains
Parent material: Sandstone
Surface textural class: Gravelly loam, loam
Slope: Steep to very steep

Gonzaga

Depth class: Moderately deep
Drainage class: Well drained
Position on landform: Mountains, dominantly on north-facing slopes
Parent material: Shale
Surface textural class: Loam, gravelly loam
Slope: Steep to very steep

Minor Soils

- Franciscan and Hytop soils on mountains, dominantly on north-facing slopes
- Vallecitos soils on mountains, dominantly on south-facing slopes
- Millsholm soils and Rock outcrop on mountains

Use and Management

Major uses: Livestock grazing

Management concerns: Available water capacity, erosion hazard, and slope

Management measures: Controlled grazing

12. Hentine-Henneke Association

Shallow, steep to very steep, well drained soils formed in serpentinitic rock; on mountains in the southwestern area

Setting

Landform: Mountains
Slope range: 30 to 70 percent

Composition

Extent of the association: 3 percent of the survey area
Extent of the soils in the association:
Hentine soils—42 percent
Henneke soils—36 percent
Minor components—22 percent

Soil Properties and Qualities

Hentine (figure 5)

Depth class: Shallow

Drainage class: Well drained
Position on landform: Mountains
Parent material: Serpentinitic rock
Surface textural class: Gravelly loam, very cobbly loam
Slope: Steep to very steep

Henneke

Depth class: Shallow
Drainage class: Well drained
Position on landform: Mountains
Parent material: Serpentinitic rock
Surface textural class: Gravelly loam
Slope: Steep to very steep

Minor Components

- Rock outcrop

Use and Management

Major uses: Livestock grazing

Management concerns: Available water capacity, erosion hazard, and slope

Management measures: Controlled grazing

Figure 3.—Aerial view showing major landforms. In the foreground are the more rounded hills of dominantly calcareous soils of the Carbona-Calla association. In the skyline are steep mountains of dominantly soils formed in metamorphic material of the Honker-Gaviota-Gonzaga association.

Figure 4.—A typical profile of Gaviota soils, which are major soils in the Honker-Gaviota-Gonzaga association. These soils are shallow, steep to very steep, and well drained and formed in sandstone on mountains.

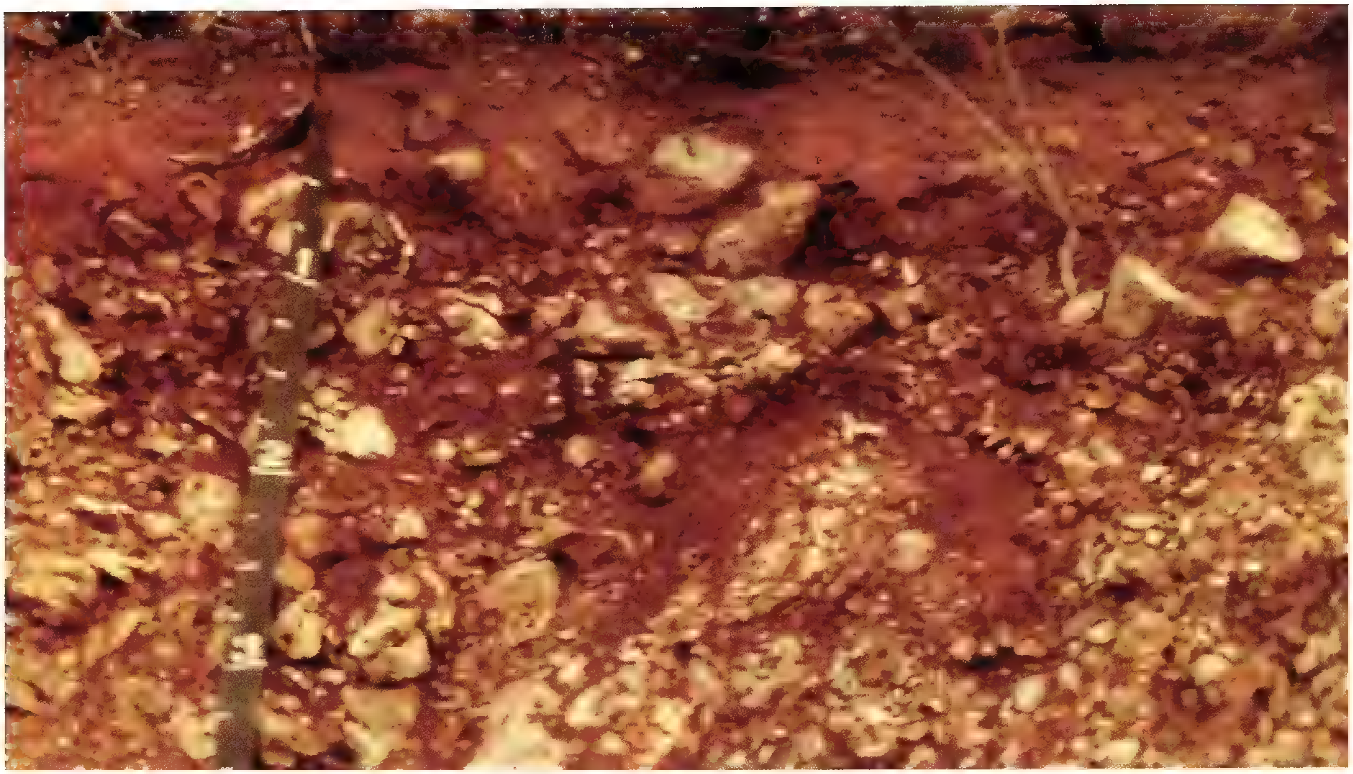


Figure 5.—A typical profile of Hentine soils, which are major soils in the Hentine-Henneke association. These soils are shallow, steep to very steep, and well drained and formed in serpentinitic rock on mountains.

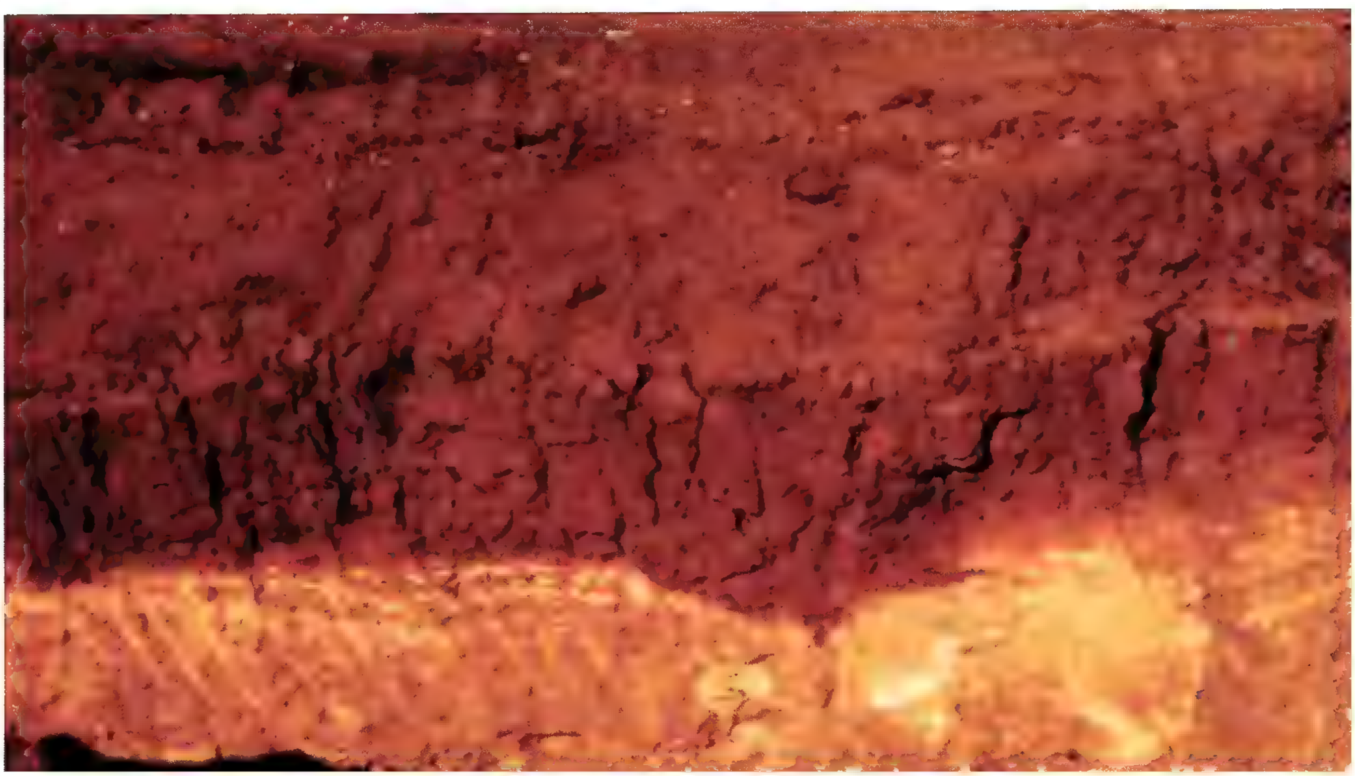


Figure 6.—A trench exposing a profile of Damluis clay loam, 0 to 2 percent slopes. Damluis soils are very deep and well drained and formed in alluvium derived from mixed rock sources. They are the dominant soils in general soil map unit 8.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Damluis clay loam, 0 to 2 percent slopes, is a phase of the Damluis series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes, is an example.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Some areas that are too small to be shown are identified by a special symbol on the map.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (listed in the Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

100—Capay clay, 0 to 2 percent slopes

Setting

Landform: Interfan basins
Elevation: 40 to 250 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Capay clay and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Capay Soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 20 inches—dark grayish brown clay
Subsoil:
20 to 60 inches—dark grayish brown and brown clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Moderately well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
• Stomar soils on higher positions
• Vernalis soils on slightly higher positions
• Zacharias soils on higher positions
Similar inclusions:
• Areas with a surface layer of silty clay or clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Fine surface texture, restricted permeability
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Shrink-swell, restricted permeability, low strength
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2s-5, irrigated; 4s-5, nonirrigated
MLRA: 17
Vegetative soil group: C

101—Capay clay, wet, 0 to 2 percent slopes

Setting

Landform: Interfan basins
Landscape features: As a result of the application of irrigation water on this unit, an apparent water table has developed at a depth of 2 to 6 feet.
Elevation: 30 to 200 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs

Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Capay clay and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Capay Soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 20 inches—dark grayish brown clay
Subsoil:
20 to 60 inches—dark grayish brown and brown clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Moderately well drained
Water table: 4 to 6 feet below the soil surface, from October to March; 2 to 4 feet from April to September
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
- Stomar soils on higher positions
- Vernalis soils on higher positions

Similar inclusions:
- Areas with a surface layer of silty clay on similar positions
- Capay soils that lack an apparent water table on slightly higher positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High water table, fine surface texture, restricted permeability
- High water table limits the suitability for deep rooted crops or can cause crop damage.
- Irrigation must be carefully managed to avoid raising the water table.
- The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
- The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, shrink-swell, restricted permeability, low strength
- Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome these limitations.

Interpretive Groups

Capability classification: 2w-5, irrigated; 4w-5, nonirrigated
MLRA: 17
Vegetative soil group: C

102—Capay clay, loamy substratum, 0 to 2 percent slopes

Setting

Landform: Interfan basins
Elevation: 25 to 175 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Capay clay, loamy substratum, and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Capay soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 20 inches—dark grayish brown clay
Subsoil:
20 to 35 inches—grayish brown clay
35 to 45 inches—yellowish brown clay loam
Substratum:
45 to 60 inches—yellowish brown loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Moderately well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow over moderate in the loamy substratum
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
- Capay soils that lack loamy substrata on similar positions
- Stomar soils on higher positions
- Vernalis soils on slightly higher positions
- Zacharias soils on higher positions

Similar inclusions:
- Areas with a surface layer of silty clay or clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Fine surface texture, restricted permeability
- The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
- The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Shrink-swell, restricted permeability, low strength
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
- The limitation of restricted permeability may also be overcome by placing leach lines at a deeper depth into a more permeable layer.

Interpretive Groups

Capability classification: 2s-5, irrigated; 4s-5, nonirrigated
MLRA: 17
Vegetative soil group: C

106—Capay clay, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Interfan basins
Elevation: 40 to 250 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Capay clay and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Capay soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 20 inches—dark grayish brown clay
Subsoil:
20 to 60 inches—dark grayish brown and brown clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Moderately well drained

Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
• Stomar soils on higher positions
• Vernalis soils on slightly higher positions
• Zacharias soils on higher positions
Similar inclusions:
• Areas with a surface layer of silty clay or clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Flooding, fine surface texture, restricted permeability
• Flooding hazard limitations should be considered before any cropping or capital improvements are installed.
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, shrink-swell, restricted permeability, low strength
• Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil to support a load.
• Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2s-5, irrigated; 4s-5, nonirrigated
MLRA: 17
Vegetative soil group: C

110—El Solyo silty clay loam, 0 to 2 percent slopes

Setting

Landform: Low alluvial fans
Elevation: 60 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 265 to 275 days

Composition

El Solyo silty clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the El Solyo soil

Parent material: Alluvium from sedimentary and metamorphic rock sources

Typical profile

Surface layer:
0 to 17 inches—pale brown silty clay loam
Subsoil:
17 to 60 inches—pale brown silty clay loam and light yellowish brown silty clay

Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very high
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Stomar soils on higher positions
• Vernalis soils on similar positions
• Zacharias soils on higher positions
Similar inclusions:
• Areas with a surface layer of silty clay or clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Moderately fine surface texture, restricted permeability
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Shrink-swell, restricted permeability, low strength
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2s-3, irrigated; 4s-3, nonirrigated
MLRA: 17
Vegetative soil group: C

111—El Solyo clay loam, wet, 0 to 2 percent slopes

Setting

Landform: Low alluvial fans
Landscape features: As a result of the excessive application of water for irrigation, an apparent water table has developed at a depth of 2 to 4 feet during the growing season.
Elevation: 40 to 200 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 265 to 275 days

Composition

El Solyo clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the El Solyo soil

Parent material: Alluvium from sedimentary and metamorphic rock sources

Typical profile

Surface layer:
0 to 17 inches—pale brown clay loam
Subsoil:
17 to 60 inches—pale brown silty clay loam and light yellowish brown silty clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: 4 to 6 feet below the soil surface from December to March and 2 to 4 feet below the surface from April to September
Kind of water table: Apparent
Available water capacity: Very high
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Capay soils on lower positions
• Vernalis soils on similar positions
Similar inclusions:
• Areas with a surface layer of silty clay on similar positions
• El Solyo soils that lack an apparent water table on higher positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High water table,

moderately fine surface texture, restricted permeability
• Irrigation must be carefully managed to avoid raising the water table.
• Deep rooted crops are suited to areas with natural drainage or where a drainage system has been installed.
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil to regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, shrink-swell, restricted permeability, low strength
• Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome these limitations.

Interpretive Groups

Capability classification: 2w-3, irrigated; 4w-3, nonirrigated
MLRA: 17
Vegetative soil group: C

116—El Solyo silty clay loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Low alluvial fans
Elevation: 60 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 265 to 275 days

Composition

El Solyo silty clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the El Solyo soil

Parent material: Alluvium from sedimentary and metamorphic rock sources

Typical profile

Surface layer:
0 to 17 inches—pale brown silty clay loam
Subsoil:
17 to 60 inches—pale brown silty clay loam and light yellowish brown silty clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very high
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Vernalis soils on similar positions
• Zacharias soils on higher positions
Similar inclusions:
• Areas with a surface layer of silty clay or clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Moderately fine textured surface, restricted permeability
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.

• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, shrink-swell, restricted permeability, low strength

• Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.

• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.

• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

• Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2s-3, irrigated; 4s-3, nonirrigated
MLRA: 17
Vegetative soil group: C

120—Vernalis-Zacharias complex, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 50 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Vernalis clay loam and similar soils: 45 percent
Zacharias clay loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Vernalis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 20 inches—brown clay loam
Subsoil:
20 to 62 inches—yellowish brown and light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow surface over moderate subsoil
Intake family: 0.7
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown clay loam
Subsoil:
14 to 66 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Capay soils on lower positions
• Stomar soils on slightly higher positions
Similar inclusions:
• Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops

Major management factors: Few limitations
• Furrow, border, and sprinkler irrigation systems are suited to this unit (figure 7).

Homesite Development

Major management factors: Vernalis—restricted permeability, low strength; Zacharias—restricted permeability
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 1, irrigated; 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

121—Vernalis loam, wet, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Landscape features: As a result of the excessive application of water for irrigation, an apparent water table has developed at a depth of 2 to 4 feet during the growing season.
Elevation: 25 to 275 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Vernalis loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Figure 7.—Irrigation of an apricot orchard in an area of Vernalis-Zacharias complex, 0 to 2 percent slopes.

Characteristics of the Vernalis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 20 inches—brown loam
Subsoil:
20 to 62 inches—yellowish brown and light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: 4 to 6 feet below the soil surface from October to March and 2 to 4 feet below the surface from April to September
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderate
Intake family: 1.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils in basins
- Zacharias soils on higher positions

Similar inclusions:
- Areas with a surface layer of clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Depth to seasonal high water table
- Irrigation must be carefully managed to avoid raising the water table.
- Deep rooted crops are suited to areas with natural drainage or where a drainage system has been installed.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, restricted permeability, low strength
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome these limitations.

Interpretive Groups

Capability classification: 2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: A

122—Vernalis loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 25 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Vernalis loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Vernalis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 20 inches—brown loam
Subsoil:
20 to 62 inches—yellowish brown and light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 5 feet
Natural drainage class: Well drained
Depth to seasonal high water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderate
Intake family: 1.5
Surface runoff: Negligible to low
Shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Hazard of soil bloswing in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on concave positions

- Stomar soils on higher positions
- Zacharias soils on higher positions

Similar inclusions:
- Areas with a surface layer of clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: None
- Furrow, border, and sprinkler irrigation systems are suited to this unit.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and maintains the water intake rate.

Homesite Development

Major management factors: Low strength
- Buildings and roads should be designed to offset the limited ability of the soil to support a load.

Interpretive Groups

Capability classification: 1, irrigated; 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

123—Vernalis clay loam, wet, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Landscape features: As a result of the excessive application of water for irrigation, an apparent water table has developed at a depth of 2 to 4 feet during the growing season.
Elevation: 25 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Vernalis clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Vernalis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 20 inches—brown clay loam
Subsoil:
20 to 62 inches—yellowish brown and light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained, but is now moderately well drained, because of an apparent water table
Water table: 4 to 6 feet below the soil surface, from January through December
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow surface over moderate subsoil
Intake family: 0.7
Surface runoff: Negligible to low
Shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils in concave positions
- Stomar soils on slightly higher positions
- Zacharias soils on slightly higher positions

Similar inclusions:
- Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High water table
- High water table limits the suitability for deep rooted crops or can cause crop damage.
- Deep rooted crops are suited to areas with natural drainage or where a drainage system has been installed.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, restricted permeability, low strength
- Buildings and roads should be designed to offset the limited ability of the soil to support a load.
- When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.

Interpretive Groups

Capability classification: 2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: A

125—Vernalis clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 75 to 280 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Vernalis clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Vernalis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 20 inches—brown clay loam
Subsoil:
20 to 62 inches—yellowish brown and light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Depth to water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow surface over moderate subsoil
Intake family: 0.7
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils in concave positions
- Stomar soils on slightly higher positions
- Zacharias soils on slightly higher positions

Similar inclusions:
- Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Few limitations
- Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Restricted permeability, low strength
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 1, irrigated; unit 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

126—Vernalis-Zacharias complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Alluvial fans
Elevation: 25 to 250 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Vernalis clay loam and similar soils: 45 percent
Zacharias clay loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Vernalis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 20 inches—brown clay loam
Subsoil:
20 to 62 inches—yellowish brown and light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained

Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow surface over moderate subsoil
Intake family: 0.7
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown clay loam
Subsoil:
14 to 66 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils in concave positions
- Stomar soils on slightly higher positions

Similar inclusions:
- Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Major management factors: Vernalis and Zacharias—flooding
Commonly grown crops: Row, field, and orchard crops
- Flooding hazard limitations should be considered before any cropping or capital improvements are installed.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Vernalis—flooding, restricted permeability, low strength; Zacharias—flooding, restricted permeability
- Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 1, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: A

127—Vernalis loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Alluvial fans
Elevation: 100 to 150 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Vernalis loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Vernalis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 20 inches—brown loam
Subsoil:
20 to 62 inches—yellowish brown and light yellowish brown clay loam

Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderate
Intake family: 1.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils in concave positions
- Stomar soils on higher positions
- Zacharias soils on higher positions

Similar inclusions:
- Areas with a surface layer of clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Flooding
- Flooding hazard limitations should be considered before any cropping or capital improvements are installed.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, low strength
- Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Interpretive Groups

Capability classification: 1, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: A

128—Water

130—Stomar clay loam, 0 to 2 percent slopes

Setting

Landform: Dissected alluvial fans
Elevation: 40 to 360 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Stomar clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Stomar soil

Parent material: Alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 11 inches—yellowish brown clay loam
Subsoil:
11 to 38 inches—yellowish brown clay loam and clay
38 to 60 inches—light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very high
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils in concave positions
- Vernalis soils on slightly lower positions
- Zacharias soils on similar positions

Similar inclusions:
- Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops

Major management factors: Restricted permeability
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Shrink-swell, restricted permeability, low strength
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2s-3, irrigated; 4s-3, nonirrigated
MLRA: 17
Vegetative soil group: C

131—Stomar clay loam, wet, 0 to 2 percent slopes

Setting

Landform: Dissected alluvial fans
Landscape features: As a result of the excessive application of water for irrigation, an apparent water table has developed at a depth of 2 to 4 feet during the growing season.
Elevation: 30 to 100 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Stomar clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Stomar soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 11 inches—yellowish brown clay loam
Subsoil:
11 to 38 inches—yellowish brown clay loam and clay
38 to 60 inches—light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: 4 to 6 feet below the soil surface, from October to March; 2 to 4 feet from April to September
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Capay soils on lower positions
• Vernalis soils on slightly lower positions
• Zacharias soils on similar positions
Similar inclusions:
Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High water table, restricted permeability
• High water table limits the suitability for deep rooted crops or can cause crop damage.
• Irrigation must be carefully managed to avoid raising the water table.
• Deep rooted crops are suited to areas with natural drainage or where a drainage system has been installed.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, shrink-swell, restricted permeability, low strength
• Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• When septic tanks are used, a high water table and restricted permeability limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome these limitations.

Interpretive Groups

Capability classification: 2w-3, irrigated; 4w-3, nonirrigated
MLRA: 17
Vegetative soil group: C

140—Zacharias clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and low stream terraces
Elevation: 50 to 400 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Zacharias clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown clay loam
Subsoil:
14 to 66 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Capay soils on lower positions
• Stomar soils on similar positions
• Vernalis soils on slightly lower positions
Similar inclusions:
• Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Few limitations
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Restricted permeability, low strength
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Interpretive Groups

Capability classification: 1, irrigated; 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

141—Zacharias clay loam, wet, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and low stream terraces
Landscape features: As a result of the excessive application of water for irrigation water, an apparent water table has developed at a depth of 2 to 4 feet during the growing season.
Elevation: 50 to 400 feet

Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Zacharias clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown clay loam
Subsoil:
14 to 66 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: 4 to 6 feet below the soil surface, from October to March; 2 to 4 feet from April to September
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on lower positions
- Stomar soils on similar positions
- Vernalis soils on slightly lower positions

Similar inclusions:
- Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High water table
- High water table limits the suitability for deep rooted crops or can cause crop damage.
- Irrigation must be carefully managed to avoid raising the water table.
- Deep rooted crops are suited to areas with natural drainage or where a drainage system has been installed.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, restricted permeability, low strength
- Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome these limitations.

Interpretive Groups

Capability classification: 2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: A

142—Zacharias gravelly clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and low stream terraces
Elevation: 50 to 400 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Zacharias gravelly clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown gravelly clay loam
Subsoil:
14 to 66 inches—yellowish brown gravelly clay loam

Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on lower positions
- Stomar soils on similar positions
- Vernalis soils on slightly lower positions

Similar inclusions:
- Areas with a surface layer of clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Surface rock fragments
- Surface rock fragments cause rapid wear of tillage equipment.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Restricted permeability, low strength
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Livestock Grazing

Common plants on the Zacharias soil: Soft chess, filaree, wild oats, and red brome
Major management factors: Gravelly moderately fine surface texture
- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Interpretive Groups

Capability classification: 2s-4, irrigated; 4s-4, nonirrigated
MLRA: 17
Ecological site: Loamy
Vegetative soil group: A

144—Zacharias gravelly clay loam, 2 to 5 percent slopes

Setting

Landform: Alluvial fans and low stream terraces
Elevation: 50 to 400 feet
Slope features: Gently sloping
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Zacharias gravelly clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown gravelly clay loam
Subsoil:
14 to 66 inches—yellowish brown gravelly clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on concave positions
- Stomar soils on similar positions
- Vernalis soils on slightly lower positions

Similar inclusions:
- Areas with a surface layer of clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops

Major management factors: Slope, hazard of water erosion, surface rock fragments

- All tillage should be on the contour or across the slope.
- When soil is bare, erosion can be reduced by crop residue management or the establishment of a cover crop.
- Surface rock fragments cause rapid wear of tillage equipment.
- Sprinkler and drip irrigation systems are suited to this unit.
- Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Livestock Grazing

Common plants on the Zacharias soil: Soft chess, filaree, wild oats, and red brome

Major management factors: Gravelly moderately fine surface texture

- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Restricted permeability, low strength

- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Interpretive Groups

Capability classification: 2e-4, irrigated; 4e-4, nonirrigated
MLRA: 17
Ecological site: Loamy
Vegetative soil group: A

145—Zacharias clay loam, 2 to 5 percent slopes

Setting

Landform: Alluvial fans and low stream terraces
Elevation: 200 to 400 feet
Slope features: Gently sloping
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Zacharias clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown clay loam
Subsoil:
14 to 66 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Low
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:

- Alo soils in concave positions in the Oak Run and Orstimba Creek Areas
- Cortina soils in drainageways
- Stomar soils on similar positions
- Vaquero soils in concave positions in the Oak Run and Orstimba Creek Areas
- Vernalis soils on slightly lower positions

Similar inclusions:

- Areas with a surface layer of gravelly clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops

Major management factors: Slope, hazard of water erosion

- All tillage should be on the contour or across the slope.
- When soil is bare, erosion can be reduced by crop residue management or the establishment of a cover crop.
- Sprinkler and drip irrigation systems are suited to this unit.
- Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Livestock Grazing

Common plants on the Zacharias soil: Soft chess, filaree, wild oats, and red brome
Major management factors: Moderately fine surface texture
• Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Restricted permeability, low strength
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Interpretive Groups

Capability classification: 2e-1, irrigated; 4e-1, nonirrigated
MLRA: 17
Ecological site: Clayey
Vegetative soil group: A

146—Zacharias clay loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Alluvial fans and low stream terraces
Elevation: 50 to 400 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Zacharias clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown clay loam
Subsoil:
14 to 66 inches—yellowish brown clay loam

Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Capay soils on concave positions
• Stomar soils on similar positions
• Vernalis soils on slightly lower positions
Similar inclusions:
• Areas with a surface layer of silty clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Flooding
• Flooding hazard limitations should be considered before any cropping or capital improvements are installed.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, restricted permeability, low strength
• Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Interpretive Groups

Capability classification: 1, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: A

147—Zacharias gravelly clay loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Alluvial fans and low stream terraces
Elevation: 50 to 400 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Zacharias gravelly clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Zacharias soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—brown gravelly clay loam
Subsoil:
14 to 66 inches—yellowish brown gravelly clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Moderately slow
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on concave positions
- Stomar soils on similar positions
- Vernalis soils on slightly lower positions

Similar inclusions:
- Areas with a surface layer of clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Surface rock fragments
- Surface rock fragments cause rapid wear of tillage equipment.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, restricted permeability, low strength
- Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Livestock Grazing

Common plants on the Zacharias soil: Soft chess, filaree, wild oats, and red brome
Major management factors: Gravelly moderately fine surface texture
- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Interpretive Groups

Capability classification: 1, irrigated; 4w-2, nonirrigated
MLRA: 17
Ecological site: Loamy
Vegetative soil group: A

150—Columbia fine sandy loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains
Landscape features: This unit is located in a designated floodway. Channeling and deposition are common along streambanks. Redoximorphic features in the profile indicate a somewhat poorly drained soil. However, levees and reclamation projects have lowered the water table.
Elevation: 25 to 50 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches

Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Columbia fine sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Columbia soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—light brownish gray and pale brown fine sandy loam
Underlying material:
14 to 60 inches—brown and pale brown stratified sandy loam to fine sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderately rapid
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Occasional, for brief to long periods from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Dello soils on similar positions
- Dospalos soils on similar positions
- Merritt soils on similar positions

Similar inclusions:
- Areas with a surface layer of sandy loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Flooding, high water table, lateral seepage
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- This unit is subject to lateral seepage in wet years when the water level is high.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, high water table
- Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: E

151—Columbia complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains
Landscape features: This unit is located in a designated floodway. Redoximorphic features in the profile indicate a somewhat poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Elevation: 25 to 50 feet
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Columbia fine sandy loam and similar soils: 45 percent
Columbia fine sandy loam, sandy substratum, and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of Columbia fine sandy loam

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—light brownish gray and pale brown fine sandy loam
Underlying material:
14 to 60 inches—brown to pale brown stratified sandy loam and fine sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderately rapid
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Characteristics of Columbia fine sandy loam, sandy substratum

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 12 inches—brown and pale brown fine sandy loam
Underlying material:
12 to 41 inches—brown and pale brown sandy loam
41 to 60 inches—light gray stratified loamy sand and sand
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderate
Intake family: 1.5
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
• Dello soils on similar positions
• Dospalos soils on similar positions
• Merritt soils on similar positions
Similar inclusions:
• Areas with a surface layer of sandy loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Columbia—flooding, high water table, lateral seepage; Columbia, sandy substratum—flooding, high water table, lateral seepage, coarse textured underlying material
• Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
• Irrigation must be carefully managed to avoid raising the water table.
• This unit is subject to lateral seepage in wet years when the water level is high.
• Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Columbia—flooding, high water table; Columbia, sandy substratum—flooding, high water table, poor filter
• Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
• When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
• Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

• The coarse texture of the underlying material limits filtering capacity. Inadequately filtered effluent can contaminate the surface or ground water. Special designs can overcome this limitation.
• As the density of homesites increase, a community disposal system should be considered.

Interpretive Groups

Capability classification: Columbia—2w-2, irrigated; 4w-2, nonirrigated; Columbia, sandy substratum—3w-11, irrigated; 4w-11, nonirrigated
MLRA: 17
Vegetative soil group: Columbia—E; Columbia, sandy substratum—B

153—Columbia fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequently flooded

Setting

Landform: Flood plains
Elevation: 25 to 50 feet
Landscape features: This unit is located in a designated floodway and is not protected by any levee system. Channeling and deposition are common along streambanks. Redoximorphic features in the profile indicate a somewhat poorly drained soil. However, drainage has now been improved by reclamation projects.
Slope features: Nearly level; channeled with numerous intermittent drainageways
Vegetation: Annual grasses, forbs, and hydrophytic vegetation
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Columbia fine sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Columbia soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—light brownish gray and pale brown fine sandy loam
Underlying material:
14 to 60 inches—brown and pale brown stratified fine sandy loam to sandy loam

Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderately rapid
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of Flooding: Frequent, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
• Dello soils on similar positions
• Dospalos soils on similar positions
• Merritt soils on similar positions
Similar inclusions:
• Areas with a surface layer of sandy loam on similar positions

Use and Management

Wildlife Habitat

Major management factors: Few limitations

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Channeled landscape, flooding, high water table, lateral seepage
• Land leveling the channeled landscape may require deep cuts that will expose highly variable stratified substrata.
• Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
• Irrigation must be carefully managed to avoid raising the water table.
• This unit is subject to lateral seepage in wet years when the water level is high.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Interpretive Groups

Capability classification: 4w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: E

155—Columbia fine sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains
Elevation: 25 to 50 feet
Landscape features: The construction of a system of levees and large upstream dams has reduced the hazard of flooding. Redoximorphic features in the profile indicate a somewhat poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Columbia fine sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Columbia soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—light brown and pale brown fine sandy loam
Underlying material:
14 to 60 inches—brown and pale brown stratified sandy loam to fine sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Most restrictive permeability: Moderately rapid
Available water capacity: Moderate
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Dello soils on similar positions
- Dospalos soils on similar positions
- Merritt soils on similar positions

Similar inclusions:
- Areas with a surface layer of sandy loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Flooding, high water table, lateral seepage
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- This unit is subject to lateral seepage in wet years when the water level is high.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, high water table
- Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
- Flooding can add additional water to the septic system. Diverting flood water reduces this limitation.

Interpretive Groups

Capability classification: Columbia—2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: E

157—Columbia complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains
Elevation: 25 to 50 feet
Landscape features: The construction of a system of levees and large upstream dams has reduced the hazard of flooding. Redoximorphic features in the profile indicate a somewhat poorly drained soil. However, levees and reclamation projects have lowered the water table.

Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Columbia fine sandy loam and similar soils: 45 percent
Columbia fine sandy loam, sandy substratum, and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Columbia soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—light brown and pale brown fine sandy loam
Underlying material:
14 to 60 inches—brown and pale brown stratified sandy loam to fine sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderately rapid
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Columbia soil with a sandy substratum

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 12 inches—brown and pale brown fine sandy loam
Underlying material:
12 to 41 inches—brown and pale brown sandy loam
41 to 60 inches—light gray stratified loamy sand and sand
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderate
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
• Dello soils on similar positions
• Dospalos soils on similar positions
• Merritt soils on similar positions
Similar inclusions:
• Areas with a surface layer of sandy loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Columbia—flooding, high water table, lateral seepage; Columbia, sandy substratum—flooding, high water table, lateral seepage, coarse textured underlying material
• Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
• Irrigation must be carefully managed to avoid raising the water table.
• This unit is subject to lateral seepage in wet years when the water level is high.
• Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Columbia—flooding, high water table; Columbia, sandy substratum—flooding, high water table, poor filter
• Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
• When septic tanks are used, a high water table limits

the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.

- Flooding can add additional water to the septic system. Diverting flood water reduces this limitation.
- The coarse texture of the underlying material limits filtering capacity. Inadequately filtered effluent can contaminate the surface or ground water. Special designs can overcome this limitation.
- As the density of homesites increase, a community disposal system should be considered.

Interpretive Groups

Capability classification: Columbia—2w-2, irrigated; 4w-2, nonirrigated; Columbia, sandy substratum—3w-11, irrigated; 4w-11, nonirrigated
MLRA: 17
Vegetative soil group: Columbia—E; Columbia, sandy substratum—B

159—Columbia complex, 0 to 2 percent slopes, frequently flooded

Setting

Landform: Flood plains
Elevation: 25 to 50 feet
Landscape features: This unit is located in a designated floodway and is not protected by any levee system. Redoximorphic features in the profile indicate a somewhat poorly drained soil. However, drainage has now been improved by reclamation projects.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Columbia fine sandy loam and similar soils: 45 percent
Columbia fine sandy loam, sandy substratum, and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Columbia soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 14 inches—light brown and pale brown fine sandy loam
Underlying material:
14 to 60 inches—brown and pale brown sandy loam and fine sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderately rapid
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Frequent, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Columbia soil with a sandy substratum

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 12 inches—brown and pale brown fine sandy loam
Underlying material:
12 to 41 inches—brown and pale brown sandy loam
41 to 60 inches—light gray stratified loamy sand and sand
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderate
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Frequent, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Dello soils on similar positions
- Dospalos soils on similar positions
- Merritt soils on similar positions

• Moderately coarse textured stratified soils with apparent water tables within 3 feet of the surface on similar positions

Similar inclusions:

• Areas with a surface layer of sandy loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Columbia—flooding, high water table, lateral seepage; Columbia, sandy substratum—flooding, high water table, lateral seepage, coarse textured underlying material

• Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
• Irrigation must be carefully managed to avoid raising the water table.
• This unit is subject to lateral seepage in wet years when the water level is high.
• Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Interpretive Groups

Capability classification: Columbia—2w-2, irrigated; 4w-2, nonirrigated; Columbia, sandy substratum—3w-11, irrigated; 4w-11, nonirrigated
MLRA: 17
Vegetative soil group: Columbia—E; Columbia, sandy substratum—B

160—Merritt silty clay loam, partially drained, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains
Elevation: 25 to 50 feet
Landscape features: This unit is located in a designated floodway. Channeling and deposition are common along streambanks. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Merritt silty clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Merritt soil

Parent material: Alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 12 inches—dark gray silty clay loam
Subsoil:
12 to 38 inches—dark grayish brown silt loam
Underlying material:
38 to 60 inches—light brownish gray stratified loamy fine sand to silt loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 4 to 6 feet below the soil surface from December through April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.3
Surface runoff: Negligible to medium
Highest shrink swell potential: Moderate
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:

• Columbia soils on similar positions
• Dello soils on similar positions
• Dospalos soils on similar positions

Similar inclusions:

• Areas with a surface layer of silt loam or fine sandy loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Flooding, high water table, lateral seepage

• Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.

- Irrigation must be carefully managed to avoid raising the water table.
- Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, high water table
- Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: E

165—Merritt silty clay loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains
Elevation: 25 to 50 feet
Landscape features: The construction of a system of levees and large upstream dams has reduced the hazard of flooding. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Merritt silty clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Merritt soil

Parent material: Alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 12 inches—grayish brown silty clay loam
Subsoil:
12 to 38 inches—dark brownish gray and grayish brown silty clay loam
Underlying material:
38 to 60 inches—grayish brown stratified fine sandy loam and sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 4 to 6 feet below the soil surface from December through April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 0.3
Surface runoff: Negligible to medium
Highest shrink swell potential: Moderate
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Columbia soils on similar positions
- Dello soils on similar positions
- Dospalos soils on similar positions

Similar inclusions:
- Areas with a surface layer of silt loam or clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Flooding, high water table, lateral seepage
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, high water table
- Flooding and a high water table can occur during the

winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
• When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
• Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: E

170—Dospalos-Bolfar complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains
Elevation: 35 to 60 feet
Landscape features: This unit is located in a designated floodway. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Dospalos clay and similar soils: 45 percent
Bolfar clay loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Dospalos soil

Parent material: Alluvium dominantly from granitic rock sources

Typical profile

Surface layer:
0 to 26 inches—olive gray and grayish brown clay
Subsoil:
26 to 44 inches—grayish brown clay loam
Underlying material:
44 to 60 inches—light brownish gray clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 5 feet below the soil surface, from December through April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Characteristics of the Bolfar soil

Parent material: Alluvium dominantly from granitic rock sources

Typical profile

Surface layer:
0 to 24 inches—grayish brown and dark grayish brown clay loam
Subsoil:
24 to 38 inches—light brownish gray and grayish brown loam
Underlying material:
38 to 60 inches—stratified pale brown loam and sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 5 feet from the soil surface, from December through April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 1.0
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Clear Lake soils in concave positions
• Columbia soils on similar positions
• Dello soils on similar positions
• Merritt soils on similar positions
Similar inclusions:
• Areas with a surface layer of silty clay loam or clay on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Dospalos—flooding, high water table, fine surface texture, restricted permeability; Bolfar—flooding, high water table, lateral seepage
• Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
• Irrigation must be carefully managed to avoid raising the water table.
• Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high.
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Dospalos—flooding, high water table, shrink-swell, restricted permeability, low strength; Bolfar—flooding, high water table, restricted permeability, low strength
• Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
• Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2w-3, irrigated; 4w-3, nonirrigated
MLRA: 17
Vegetative soil group: E

175—Dospalos-Bolfar complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains
Elevation: 35 to 60 feet
Landscape features: The construction of a system of levees and large upstream dams has reduced the hazard of flooding. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Dospalos clay and similar soils: 45 percent
Bolfar clay loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Dospalos soil

Parent material: Alluvium dominantly from granitic rock sources

Typical profile

Surface layer:
0 to 26 inches—olive gray and grayish brown clay
Subsoil:
26 to 44 inches—grayish brown clay loam
Underlying material:
44 to 60 inches—light brownish gray clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Slow
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Characteristics of the Bolfar soil

Parent material: Alluvium dominantly from granitic rock sources

Typical profile

Surface layer:
0 to 24 inches—grayish brown and dark grayish brown clay loam
Subsoil:
24 to 38 inches—light brownish gray and grayish brown loam
Underlying material:
38 to 60 inches—stratified pale brown sandy loam and clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 5 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 1.0
Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Clear Lake soils on lower positions
- Columbia soils on similar positions
- Dello soils on similar positions
- Merritt soils on similar positions

Similar inclusions:
- Areas with a surface layer of silty clay loam or clay loam on similar positions

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Dospalos—flooding, high water table, fine surface texture, restricted permeability; Bolfar—flooding, high water table, lateral seepage
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high.
- The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
- The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Dospalos—flooding, high water table, shrink—swell, restricted permeability, low strength; Bolfar—flooding, high water table, restricted permeability, low strength
- Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2w-3, irrigated; 4w-3, nonirrigated
MLRA: 17
Vegetative soil group: E

176—Dumps

Setting

Landscape features: These are smoothed or uneven accumulations of refuse that without major

reclamation are incapable of supporting plants. They are primarily refuse disposal sites.

Composition

Dumps: 100 percent

Characteristics of Dumps

Soil properties such as permeability, drainage, runoff, effective rooting depth, and available water capacity are too variable to rate.

Use and Management

This unit is poorly suited for most land uses in the county.

Interpretive Groups

This unit is not placed in an interpretive group, on site investigation is needed.

180—Dello fine sandy loam, channeled, 0 to 2 percent slopes, frequently flooded

Setting

Landform: Flood plains and old sloughs
Elevation: 25 to 50 feet
Landscape features: This unit is located in a designated floodway. Channeling and deposition are common along streambanks. Redoximorphic features in the profile indicate a very poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level channeled with numerous intermittent drainageways
Vegetation: Annual grasses, forbs, and hydrophytic vegetation
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Dello fine sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Dello soil

Parent material: Alluvium from granitic rock sources

Typical profile

Surface layer:
0 to 10 inches—pale brown fine sandy loam
Underlying material:
10 to 60 inches—light brownish gray and light gray stratified loamy fine sand to sand.
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Very poorly drained
Water table: 3 to 4 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Rapid
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Frequent, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Columbia soils on similar positions
- Soils that have coarse textured surfaces or that have buried moderately fine or fine textured substrata below a depth of 30 inches on similar positions.

Similar inclusions:
- Areas with a surface layer of loamy fine sand or sandy loam

Use and Management

Wildlife Habitat

Major management factors: Few limitations

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Channeled landscape, flooding, high water table, lateral seepage, coarse textured underlying material
- Land leveling the channeled landscape may require deep cuts that will expose highly variable stratified substrata.
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- This unit is subject to lateral seepage in wet years when the water level is high.
- Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Interpretive Groups

Capability classification: 3w-4, irrigated; 4w-4, nonirrigated
MLRA: 17

Vegetative soil group: B

190—Clear Lake clay, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Basins
Elevation: 25 to 50 feet
Landscape features: This unit is located in a designated floodway. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Clear Lake clay and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Clear Lake soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 16 inches—gray clay
Subsoil:
16 to 60 inches—dark gray clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 6 feet below the soil surface, from December to April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
- Columbia soils on similar positions
- Dello soils on similar positions
- Dospalos soils on similar positions

Similar inclusions:
- Areas with a surface layer of clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Flooding, high water table, fine surface texture, restricted permeability
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
- The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, high water table, shrink-swell, restricted permeability, low strength.
- Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2w-5, irrigated; 4w-5, nonirrigated
MLRA: 17
Vegetative soil group: C

195—Clear Lake clay, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Basins
Elevation: 25 to 50 feet
Landscape features: The construction of a system of levees and large upstream dams has reduced the hazard of flooding. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Clear Lake clay and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Clear Lake soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 16 inches—gray clay
Subsoil:
16 to 60 inches—dark gray clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 6 feet below the soil surface from December through April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
- Columbia soils on similar positions
- Dello soils on similar positions
- Dospalos soils on similar positions

Similar inclusions:
- Areas with a surface layer of clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Flooding, high water table, fine surface texture, restricted permeability
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
- The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, high water table, shrink-swell, restricted permeability, low strength.
- Flooding and a high water table can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- When septic tanks are used, a high water table and restricted permeability decreases the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2w-5, irrigated; 4w-5, nonirrigated
MLRA: 17
Vegetative soil group: C

200—Veritas sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Low fan terraces
Elevation: 25 to 50 feet
Landscape features: The construction of a system of levees and large upstream dams has reduced the hazard of flooding.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 11 to 12 inches
Mean annual temperature: 60 to 61 degrees F
Frost-free period: 260 to 270 days

Composition

Veritas sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Veritas soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 21 inches—grayish brown and brown sandy loam
Subsoil:
21 to 41 inches—brown and pale brown sandy loam
Hardpan:
41 to 60 inches—indurated light gray hardpan
Depth class: Deep
Depth to hardpan: 40 to 60 inches
Depth to bedrock: Greater than 60 inches
Natural drainage class: Moderately well drained
Water table: Greater than 6 feet, but water may be perched for very brief periods above the hardpan after heavy rains or irrigations.
Available water capacity: Moderate
Most restrictive permeability: Moderately rapid
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Columbia soils on slightly lower positions
- Dello soils on slightly lower positions
- Dospalos soils on slightly lower positions
- Merritt soils on slightly lower positions
- Xerofluvents on slightly lower positions

Similar inclusions:
- Areas with a surface layer of fine sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Depth to hardpan, flooding
- Assuming the hardpan has not been ripped, frequent irrigation cycles and controlled application rates should be applied to prevent a perched water table.
- The hardpan reduces the yield of deep rooted crops. Where feasible, deep ripping of this restrictive layer helps to overcome this limitation.
- Flooding hazard limitations should be considered before any cropping or capital improvements are installed.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Depth to hardpan, flooding
- The hard pan reduces soil volume available for filtering effluent. Tests should be made below the pan depth to determine if the lines should be placed at this depth.
- Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

Interpretive Groups

Capability classification: 2s-8, irrigated; 4s-8, nonirrigated
MLRA: 17
Vegetative soil group: A

210—Cortina gravelly sandy loam, 0 to 5 percent slopes

Setting

Landform: Alluvial fans
Elevation: 25 to 275 feet
Slope features: Nearly level to gently sloping
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 14 inches
Mean annual temperature: 60 to 62 degrees F

Frost-free period: 260 to 280 days

Composition

Cortina gravelly sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Cortina soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 6 inches—light brownish gray gravelly sandy loam
Underlying material:
6 to 38 inches—pale brown and light brownish gray stratified very gravelly loamy sand and very gravelly loam
38 to 60 inches—pale brown stratified very gravelly sand to very gravelly loamy sand
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat excessively drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately rapid
Intake family: 1.5
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—moderate

Minor Components

Dissimilar inclusions:
- Stomar soils on higher positions
- Zacharias soils on higher positions
- Xerofluvents on slightly lower positions
- Xerorthents on slightly lower positions

Similar inclusions:
- Areas with a surface layer of very gravelly sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High gravel content, limited available water capacity
- The high percentage of gravel in this unit reduces the amount of moisture available for plant growth and can cause rapid wear of tillage equipment.
- Coarse textured soils require short and frequent irrigation cycles to prevent deep percolation losses and ground water contamination.
- Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
- Sprinkler and drip irrigation systems are suited to this unit. Use of this method permits the even, controlled application of water.

Homesite Development

Major management factors: Flooding, poor filter
- Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- The coarse texture limits filtering capacity. Inadequately filtered effluent can contaminate the surface or ground water. Special designs can overcome this limitation.
- As the density of homesites increase, a community disposal system should be considered.

Interpretive Groups

Capability classification: 3s-4, irrigated; 4s-4, nonirrigated
MLRA: 17
Vegetative soil group: B

215—Yokut sandy loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 115 to 250 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Yokut sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Yokut soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 11 inches—brown sandy loam

11 to 19 inches—brown and yellowish brown loam

Subsoil:

19 to 60 inches—strong brown and brown very gravelly sandy clay loam and extremely gravelly sandy clay loam

Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate slow
Intake family: 1.5
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:

- Damluis soils on higher positions
- Stomar soils on similar positions
- Zacharias soils on similar positions
- Xerofluvents on lower positions
- Xerorthents on lower positions

Similar inclusions:

- Areas with a surface layer of gravelly sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High gravel content in subsoil, limited available water capacity

- The high gravel content in this unit reduces the amount of moisture available for plant growth and can cause rapid wear of tillage equipment.
- Coarse textured soils require short and frequent irrigation cycles to prevent deep percolation losses and ground water contamination.
- The high gravel content in this unit reduces the amount of moisture available for plant growth and can cause rapid wear of tillage equipment.
- Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
- Sprinkler and drip irrigation systems are suited to this unit. Use of this method permits the even, controlled application of water.

Homesite Development

Major management factors: High gravel content in the subsoil, Restricted permeability

- The high gravel content in this unit reduces the amount of moisture available for plant growth.
- Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 3s-4, irrigated; 4s-4, nonirrigated
MLRA: 17
Vegetative soil group: B

220—Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded

Setting

Landform: Alluvial fans
Position on landscape: In arroyos, in intermittent stream channels and gravel tailing deposits
Landscape features: Slopes are plane or convex on alluvial fans and in arroyos; and complex in stream channels and gravel tailing deposits. Channeling and deposition are common along streambanks.
Elevation: 125 to 500 feet
Slope features: Nearly level to gently sloping
Vegetation: Annual grasses and forbs
Mean annual precipitation: 9 to 13 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Xerofluvents and similar soils: 60 percent
Xerorthents and similar soils: 30 percent
Dissimilar inclusions: 10 percent

Characteristics of the Xerofluvents

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:

0 to 20 inches—brown very gravelly loam and gravelly sandy loam

Underlying material:

20 to 60 inches—stratified pale brown very gravelly loamy coarse sand, pale brown very gravelly sandy loam, very gravelly loamy coarse sand and pale brown sandy loam

Depth class: Very deep
Depth to bedrock: Greater than 60 inches

Natural drainage class: Well to somewhat excessively
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Rapid to slow because of the variability of the substratum
Intake family: 1.5
Surface runoff: Low
Highest shrink swell potential: Low
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Moderate to severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Xerorthents

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 4 inches—pale brown gravelly sandy loam
Underlying material:
4 to 60 inches—light brownish gray stratified very gravelly sandy loam to gravelly sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well to somewhat excessively
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Rapid to slow because of the variability of the substratum
Intake family: 1.5
Surface runoff: Low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Moderate to severe
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Riverwash
- Arburua soils on adjacent mountains
- Cortina soils in drainageways
- San Timoteo soils on adjacent mountains
- Wisflat soils on adjacent mountains
- Dumps on similar positions
- Pits on similar positions
- Urban land on slightly higher positions
- Rock outcrop on similar positions
- Very shallow to deep loamy, gravelly or very gravelly soils in drainageways

Similar inclusions:
- Areas with a surface layer of sand, loamy sand, sandy loam, silt loam, gravelly sand, gravelly loamy sand, gravelly sand loam, gravelly loam or gravelly clay loam

Use and Management

Livestock Grazing

Common plants on the Xerofluvents and Xerothents: Red brome and filaree
Major management factors: Hazard of water erosion, flooding, limited available water capacity, very cobbly or extremely cobbly surface textures.
- To reduce erosion, fences should be used to keep livestock out of gullies and off streambanks.
- Livestock operations are impaired by flooding.
- Forage production is limited by surface rock fragments. When seeding is desired, consider species adapted to droughty conditions.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Xerofluvents—7w, nonirrigated; Xerorthents—6e, nonirrigated
MLRA: 15
Vegetative soil group: J

245—Bolfar-Columbia complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains
Elevation: 35 to 60 feet
Landscape features: The construction of a system of levees and large upstream dams has reduced the hazard of flooding. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches

Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Bolfar loam and similar soils: 45 percent
Columbia fine sandy loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Bolfar soil

Parent material: Alluvium dominantly from granitic rock sources

Typical profile

Surface layer:
0 to 24 inches—grayish brown and grayish brown loam
Subsoil:
24 to 38 inches—light brownish gray and grayish brown loam
Underlying material:
38 to 60 inches—stratified pale brown sandy loam to clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 5 feet below the soil surface, from December through April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 1.0
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Characteristics of the Columbia soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 12 inches—brown and grayish brown fine sandy loam
Underlying material:
12 to 41 inches—light yellowish brown and pale brown sandy loam
41 to 60 inches—stratified pale brown sand to loamy sand
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface, from December through April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderate in the surface layer and rapid in the substratum
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Clear Lake soils in concave positions
- Dello soils on similar positions
- Merritt soils on similar positions
- Veritas soils on higher positions

Similar inclusions:
- Areas with a surface layer of fine sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: Flooding, high water table, lateral seepage
- Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.
- Irrigation must be carefully managed to avoid raising the water table.
- Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Bolfar—flooding, high water table, low strength; Columbia—flooding, high water table
- Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
- Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
- Buildings and roads should be designed to offset

the limited ability of the soil in this unit to support a load.

- Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.
- When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.

Interpretive Groups

Capability classification: Bolfar—2w-2, irrigated; 4w-2, nonirrigated; Columbia—3w-11, irrigated; 4w-11, nonirrigated
MLRA: 17
Vegetative soil group: E

246—Bolfar-Columbia complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains
Elevation: 35 to 60 feet
Landscape features: This unit is located in a designated floodway. Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Bolfar loam and similar soils: 45 percent
Columbia fine sandy loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Bolfar soil

Parent material: Alluvium dominantly from granitic rock sources

Typical profile

Surface layer:
0 to 24 inches—grayish brown loam
Subsoil:
24 to 38 inches—grayish brown loam
Underlying material:
38 to 60 inches—stratified pale brown sandy loam ti clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3 to 5 feet below the soil surface, from December through April
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderately slow
Intake family: 1.0
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Characteristics of the Columbia soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 12 inches—brown and grayish brown fine sandy loam
Underlying material:
12 to 41 inches—light yellowish brown and pale brown sandy loam
41 to 60 inches—stratified pale brown loamy sand to sand
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3 to 5 feet below the soil surface from December to April
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Moderate
Intake family: 1.5
Surface runoff: Negligible or very low
Highest shrink swell potential: Low
Hazard of flooding: Occasional, for brief to long periods, from December through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Clear Lake soils in concave positions
- Dello soils on similar positions
- Merritt soils on similar positions
- Veritas soils on higher positions

Similar inclusions:
- Areas with a surface layer of fine sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops

Major management factors: Flooding, high water table, lateral seepage

• Flooding and high water table limitations should be considered when planning stand renovation or reestablishment.

• Irrigation must be carefully managed to avoid raising the water table.

• Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high.

• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Bolfar—flooding, high water table, low strength; Columbia—flooding, high water table

• Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.

• Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.

• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

• Flooding can add additional water to the septic system. Diversion of flood waters reduces this limitation.

• When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.

Interpretive Groups

Capability classification: Bolfar—2w-2, irrigated; 4w-2, nonirrigated; Columbia—3w-4, irrigated; 4w-4, nonirrigated
MLRA: 17
Vegetative soil group: For both soils—E

252—Chaqua-Arburua complex, 5 to 8 percent slopes

Setting

Landform: Chaqua—uplifted dissected terraces; Arburua—foothills
Elevation: 400 to 1,200 feet
Slope features: Gently rolling
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Chaqua loam and similar soils: 50 percent
Arburua loam and similar soils: 35 percent
Dissimilar inclusions: 15 percent

Characteristics of the Chaqua soil

Position on landscape: Sideslopes
Parent material: Calcareous alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 18 inches—grayish brown and brown loam
Subsoil:
18 to 41 inches—light brown loam
Bedrock:
41 inches—strongly weathered calcareous sandstone
Depth class: Deep
Depth to bedrock: 40 to 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Moderately slow
Intake family: 1.0
Surface runoff: Low to medium
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—moderate; concrete— low

Characteristics of the Arburua soil

Position on landscape: Sideslopes and ridges
Parent material: Calcareous shale

Typical profile

Surface layer:
0 to 6 inches—grayish brown loam
Underlying material:
6 to 22 inches—light brownish gray clay loam
Bedrock:
22 to 24 inches—weathered calcareous shale
24 inches—hard calcareous shale
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Intake family: 0.5
Surface runoff: Medium

Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• San Timoteo soils on convex positions near the shoulder of slopes
• Wisflat soils on convex positions near the shoulder of slopes
• Zacharias soils in some drainage areas
Similar inclusions:
• Soils that have a surface layer of gravelly loam or gravelly clay loam

Use and Management

Livestock Grazing

Common plants: Chaqua—soft chess, filaree, foxtail fescue; Arburua—soft chess, foxtail fescue, filaree, blue oak
Major management factors: Chaqua—hazard of water erosion; Arburua—hazard of water erosion limited available water capacity
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Irrigated Crops

Commonly grown crops: Orchard crops
Major management factors: Chaqua—slope, hazard of water erosion; Arburua—slope, hazard of water erosion, depth to rock, limited available water capacity
• All tillage should be on the contour or across the slope.
• When soil is bare, erosion can be reduced by crop residue management or the establishment of a cover crop.
• Bedrock limits rooting depth, available water capacity and irrigation efficiency.
• Water should be applied in amount sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
• Sprinkler and drip irrigation systems are suited to this unit.
• Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Homesite Development

Major management factors: Chaqua—slope, hazard of water erosion, restricted permeability; Arburua—slope, hazard of water erosion, depth to rock.
• Cuts needed to provide essentially level building sites can expose bedrock and increase the hazard of water erosion.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• The leach lines should follow the contour lines to maintain proper grade.
• Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
• The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: Chaqua—3e-1, irrigated; 4e-1, nonirrigated; Arburua—3e-8, irrigated; 4e-8, nonirrigated
MLRA: 15 and 17
Ecological site: Chaqua—loamy; and Arburua—fine loamy
Vegetative soil group: Chaqua—A; Arburua—G

253—Chaqua-Arburua complex, 8 to 15 percent slopes

Setting

Landform: Chaqua—uplifted dissected terraces; Arburua—foothills
Elevation: 400 to 1,200 feet
Slope features: Rolling
Vegetation: Annual grasses and forbs

Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Chaqua loam and similar soils: 50 percent
Arburua loam and similar soils: 35 percent
Dissimilar inclusions: 15 percent

Characteristics of the Chaqua soil

Position on landscape: Sideslopes
Parent material: Calcareous alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 18 inches—grayish brown loam
Subsoil:
18 to 41 inches—brown loam
Bedrock:
41 inches—strongly weathered calcareous sandstone
Depth class: Deep
Depth to bedrock: 40 to 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Moderately slow
Intake family: 1.0
Surface runoff: Medium
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—moderate; concrete; low

Characteristics of the Arburua soil

Position on landscape: Sideslopes and ridges
Parent material: Calcareous shale

Typical profile

Surface layer:
0 to 6 inches—grayish brown loam
Underlying material:
6 to 22 inches—light brownish gray clay loam
Bedrock:
22 to 24 inches—weathered calcareous shale
24 inches—hard calcareous shale
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Surface runoff: Low to medium
Intake family: 0.5
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Carbona soils on toe slopes
- San Timoteo soils on convex positions near the shoulder of slopes
- Wisflat soils on convex positions near the shoulder of slopes
- Rock outcrop in severely eroded areas

Similar inclusions:
- Soils that have a surface layer of gravelly loam or gravelly clay loam

Use and Management

Livestock Grazing

Common plants: Chaqua—soft chess, filaree, foxtail fescue; Arburua—soft chess, foxtail fescue, filaree, blue oak
Major management factors: Chaqua—hazard of water erosion; Arburua—hazard of water erosion limited available water capacity
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Irrigated Crops

Commonly grown crops: Orchard crops
Major management factors: Chaqua—slope, hazard of water erosion; Arburua—slope, hazard of water erosion, depth to rock, limited available water capacity
- All tillage should be on the contour or across the slope.
- When soil is bare, erosion can be reduced by crop residue management or the establishment of a cover crop.

- Bedrock limits rooting depth, available water capacity, and irrigation efficiency.
- Water should be applied in amount sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients.
- Sprinkler and drip irrigation systems are suited to this unit.
- Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Homesite Development

Major management factors: Chaqua—slope, hazard of water erosion, restricted permeability; Arburua—slope, hazard of water erosion, depth to rock.
- Cuts needed to provide essentially level building sites can expose bedrock and increase the hazard of water erosion.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
- The leach lines should follow the contour lines to maintain proper grade.
- Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
- The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: Chaqua—3e-1, irrigated; 4e-1, nonirrigated; Arburua—3e-8, irrigated; 4e-8, nonirrigated
MLRA: 15 and 17
Ecological site: Chaqua—loamy; and Arburua—fine loamy
Vegetative soil group: Chaqua—A; Arburua—G

255—Calla-Carbona complex, 30 to 50 percent slopes

Setting

Landform: Uplifted dissected terraces
Elevation: 300 to 1,300 feet
Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Calla clay loam and similar soils: 50 percent
Carbona clay loam and similar soils: 35 percent
Dissimilar inclusions: 15 percent

Characteristics of the Calla soil

Parent material: Calcareous alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 11 inches—light brownish gray clay loam
Subsoil:
11 to 30 inches—brown and light brownish gray clay loam
30 to 60 inches—brown, light yellowish brown and very pale brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very high
Most restrictive permeability: Moderately slow
Surface runoff: High
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Carbona soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 15 inches—dark grayish brown clay loam
Subsurface layer:
15 to 24 inches—dark grayish brown clay
Subsoil:
24 to 50 inches—brown and yellowish brown clay
Substratum:
50 to 60 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 6 feet
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Surface runoff: Very high
Highest shrink swell potential: High

Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete; low

Minor Components

Dissimilar inclusions:
- Arburua soils on convex positions near the top of slopes
- Wisflat soils on convex positions near the top of slopes
- San Timoteo soils on convex positions near the top of slopes

Similar inclusions:
- Soils that have a surface layer of loam
- Calla soils that are gravelly throughout on similar positions
- Carbona soils that are gravelly throughout on similar positions

Use and Management

Livestock Grazing

Common plants: Calla—soft chess, red brome, filaree, wild oats; Carbona—soft chess, filaree, wild oats, red brome
Major management factors: Hazard of water erosion, moderately fine surface texture
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Slope, hazard of water erosion, high shrink-swell potential, restricted permeability, low strength
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The leach lines should follow the contour lines to maintain proper grade.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 17
Ecological site: Calla—loamy; Carbona—clayey
Vegetative soil group: Calla—A; Carbona—C

270—Elsalado fine sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Alluvial fans
Elevation: 40 to 275 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 270 days

Composition

Elsalado fine sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Elsalado soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 6 inches—brown fine sandy loam
Subsoil:
6 to 26 inches—brown loam
26 to 60 inches—brown loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately rapid surface over moderate subsoil
Intake family: 1.5
Surface runoff: Neglible to low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on slightly lower positions
- Zacharias soils on higher positions

• Vernalis soils on higher positions
Similar inclusions:
• Areas with a surface layer of loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Flooding, moderately rapid permeability of the surface layer
• Flooding hazard limitations should be considered before any cropping or capital improvements are installed.
• This unit requires short and frequent irrigation cycles when germinating seedlings to keep the surface moist.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Rare flooding
• Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.

Interpretive Groups

Capability classification: 1, irrigated; 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

271—Elsalado loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Alluvial fans
Elevation: 40 to 275 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Elsalado loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Elsalado soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 6 inches—brown loam
Subsoil:
6 to 26 inches—brown loam
26 to 60 inches—brown loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderate
Intake family: 1.0
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Capay soils on slightly lower positions
• Zacharias soils on higher positions
• Vernalis soils on higher positions
Similar inclusions:
• Areas with a surface layer of fine sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Flooding
• Flooding hazard limitations should be considered before any cropping or capital improvements are installed.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding
• Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.

Interpretive Groups

Capability classification: 1, irrigated; 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

272—Elsalado loam, wet, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Landscape features: As a result of the excessive application of water for irrigation, an apparent water table has developed at a depth of 2 to 4 feet during the growing season.
Elevation: 40 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 270 days

Composition

Elsalado loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Elsalado soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 6 inches—brown loam
Subsoil:
6 to 26 inches—brown loam
26 to 60 inches—brown loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: 4 to 6 feet below the soil surface, from December to March
Kind of water table: Apparent
Available water capacity: High
Most restrictive permeability: Moderate
Intake family: 1.0
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on slightly lower positions
- Zacharias soils on higher positions
- Vernalis soils on higher positions

Similar inclusions:
- Areas with a surface layer of fine sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: High water table
- Irrigation must be carefully managed to avoid raising the water table.
- Deep rooted crops are suited to areas with natural drainage or where a drainage system has been installed.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table
- When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.

Interpretive Groups

Capability classification: 2w-2, irrigated; 4w-2, nonirrigated
MLRA: 17
Vegetative soil group: A

273—Elsalado fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 40 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 270 days

Composition

Elsalado fine sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Elsalado soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 6 inches—brown fine sandy loam
Subsoil:
6 to 26 inches—brown loam

26 to 60 inches—brown loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately rapid surface over moderate subsoil
Intake family: 1.5
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on slightly lower positions
- Zacharias soils on higher positions
- Vernalis soils on higher positions

Similar inclusions:
- Areas with a surface layer of loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Few limitations
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Few limitations

Interpretive Groups

Capability classification: 1, irrigated; 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

274—Elsalado loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 40 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 270 days

Composition

Elsalado loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Elsalado soil

Parent material: Alluvium from sandstone and shale

Typical profile

Surface layer:
0 to 6 inches—brown loam
Subsoil:
6 to 26 inches—brown loam
26 to 60 inches—brown loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderate
Intake family: 1.0
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils on slightly lower positions
- Zacharias soils on higher positions
- Vernalis soils on higher positions

Similar inclusions:
- Areas with a surface layer of fine sandy loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Few limitations
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Few limitations

Interpretive Groups

Capability classification: 1, irrigated; 4c-1, nonirrigated
MLRA: 17
Vegetative soil group: A

281—Carbona clay loam, 2 to 8 percent slopes

Setting

Landform: Uplifted dissected terraces
Elevation: 220 to 500 feet
Slope features: Undulating to gently rolling

Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 260 to 280 days

Composition

Carbona clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Carbona soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 15 inches—dark grayish brown clay loam
15 to 24 inches—dark grayish brown clay
Subsoil:
24 to 50 inches—brown and yellowish brown clay loam
50 to 60 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: High
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Calla soils in similar positions
- Cortina soils in drainageways
- Stomar soils on similar positions
- Vernalis soils on slightly lower positions

Similar inclusions:
- Areas with a surface layer of gravelly clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Row, field, and orchard crops
Major management factors: Slope, restricted permeability
- All tillage should be on the contour or across the slope.
- The restricted permeability requires an irrigation design with low application rates and longer application periods to prevent stand deterioration and invasion of hydrophytic plants.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Sprinkler and drip irrigation systems are suited to this unit.
- Use of this method permits the even, controlled application of water and reduces runoff.

Livestock Grazing

Common plants on the Carbona soil: Soft chess, filaree, wild oats, red brome
Major management factors: Carbona—moderately fine surface texture
- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Carbona—shrink-swell, low strength
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2e-5, irrigated; 4e-5, nonirrigated
MLRA: 17
Ecological site: Clayey
Vegetative soil group: C

290—Carbona-Orognen complex, 15 to 30 percent slopes

Setting

Landform: Uplifted dissected terraces
Elevation: 400 to 1,200 feet
Slope features: Hilly
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 250 to 270 days

Composition

Carbona clay loam and similar soils: 45 percent
Orognen gravelly clay loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Carbona soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 15 inches—dark grayish brown clay loam
15 to 24 inches—dark grayish brown clay
Subsoil:
24 to 50 inches—brown and yellowish brown clay loam
50 to 60 inches—yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Characteristics of the Orognen soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 11 inches—brown gravelly clay loam
Subsoil:
11 to 40 inches—reddish brown gravelly clay
40 to 60 inches—brown and strong brown clay
Depth class: Very deep
Depth to claypan: 10 to 19 inches
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Very slow
Intake family: 0.5
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Calla soils on similar positions
- Very deep medium textured very gravelly soils in dissected drainageways with accumulations of cobbles and stones on the surface

Similar inclusions:
- Carbona soils on 8 to 15 percent toe slopes and on 30 to 50 percent slopes on slightly higher positions
- Orognen soils on 8 to 15 percent toe slopes and on 30 to 50 percent slopes on slightly higher positions
- Soils that have a surface layer of gravelly loam

Use and Management

Livestock Grazing

Common plants: Carbona—soft chess, filaree, wild oats, red brome; Orognen—wild oats, Mediterranean barley, foxtail fescue, filaree
Major management factors: Carbona and Orognen—hazard of water erosion, moderately fine surface texture
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Carbona—slope, hazard of water erosion, shrink-swell, low strength; Orognen—slope, hazard of water erosion, shrink-swell, restricted permeability in the claypan, low strength
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The leach lines should follow the contour lines to maintain proper grade.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 4e-5, nonirrigated
MLRA: 17
Ecological site: Carbona—clayey; Orognen—loamy
Vegetative soil group: Carbona—C; Orognen—D

291—Carbona-Orognen complex, 30 to 50 percent slopes

Setting

Landform: Uplifted dissected terraces
Elevation: 400 to 1,200 feet
Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 250 to 270 days

Composition

Carbona clay loam and similar soils: 45 percent
Orognen gravelly clay loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Carbona soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 15 inches—dark grayish brown clay loam
15 to 24 inches—dark grayish brown clay
Subsoil:
24 to 50 inches—brown and yellowish brown clay loam
50 to 60 inches—yellowish brown clay loam
Depth class: Very deep
Natural drainage class: Well drained
Depth to bedrock: Greater than 60 inches
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Orognen soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 11 inches—brown gravelly clay loam
Subsoil:
11 to 40 inches—reddish brown gravelly clay
40 to 60 inches—brown and strong brown clay
Depth class: Very deep
Depth to claypan: 10 to 19 inches
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Very slow
Intake family: 0.5
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Calla soils on similar positions
- Very deep medium textured very gravelly soils in dissected drainageways with accumulations of cobbles and stones on the surface

Similar inclusions:
- Carbona on 50 to 65 percent slopes and on 15 to 30 percent slopes on slightly lower positions
- Orognen soils on 50 to 65 percent slopes and on 15 to 30 percent slopes on slightly lower positions
- Soils that have a surface layer of gravelly loam

Use and Management

Livestock Grazing

Common plants: Carbona—soft chess, filaree, wild oats, red brome; Orognen—wild oats, Mediterranean barley, foxtail fescue, filaree
Major management factors: Carbona and Orognen—hazard of water erosion, moderately fine surface texture
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 17
Ecological site: Carbona—clayey; Orognen—loamy
Vegetative soil group: Carbona—C; Orognen—D

300—Damluis clay loam, 0 to 2 percent slopes

Setting

Landform: Low terraces
Elevation: 120 to 350 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Damluis clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Damluis soil

Parent material: Alluvium from mixed rock sources

Typical profile (figure 6, page 27)

Surface layer:
0 to 22 inches—brown clay loam
Subsoil:
22 to 30 inches—brown clay
30 to 40 inches—brown clay loam
Substratum:
40 to 60 inches—strong brown very gravelly sandy clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Stomar soils on slightly lower positions
- Zacharias soils on lower positions
- Fine textured soils that are very gravelly throughout
- Areas that have been severely cut and filled

Similar inclusions:
- Areas with a surface layer of gravelly clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Orchard crops
Major management factors: Restricted permeability
- The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border and sprinkler irrigation systems are suited to this unit.

Livestock Grazing

Common plants on the Damluis soil: Soft chess, filaree, wild oats
Major management factors: Moderately fine surface layer
- Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Shrink-swell, restricted permeability, low strength
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Interpretive Groups

Capability classification: 2s-3, irrigated; 4s-3, nonirrigated
MLRA: 17
Ecological site: Fine loamy
Vegetative soil group: C

301—Damluis clay loam, 2 to 8 percent slopes

Setting

Landform: Low terraces
Elevation: 120 to 350 feet
Slope features: Undulating to gently rolling
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F

Frost-free period: 260 to 280 days

Composition

Damluis clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Damluis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 22 inches—brown clay loam
Subsoil:
22 to 30 inches—brown clay
30 to 40 inches—brown clay loam
Substratum:
40 to 60 inches—strong brown very gravelly sandy clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Low to high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Stomar soils on slightly lower positions
• Zacharias soils on lower positions
• Fine textured soils that are very gravelly throughout and areas that have been severely cut and filled
Similar inclusions:
• Areas with a surface layer of gravelly clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Orchard crops
Major management factors: Slope, runoff, restricted permeability
• All tillage should be on the contour or across the slope.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Sprinkler and drip irrigation systems are suited to this unit.
• Use of this method permits the even, controlled application of water and reduces runoff.

Livestock Grazing

Common plants on the Damluis soil: Soft chess, filaree, wild oats
Major management factors: Moderately fine surface layer
• Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Slope, hazard of water erosion, shrink-swell, restricted permeability, low strength
• Excavation for roads and buildings increases the hazard of water erosion.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The leach lines should follow the contour lines to maintain proper grade.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2e-3, irrigated; 4e-3, nonirrigated
MLRA: 17
Ecological site: Fine loamy
Vegetative soil group: C

302—Damluis gravelly clay loam, 0 to 2 percent slopes

Setting

Landform: Low terraces
Elevation: 140 to 300 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs

Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Damluis gravelly clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Damluis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer: And upper part of subsoil
0 to 20 inches—dark grayish brown gravelly clay loam
Subsoil:
20 to 48 inches—dark grayish brown and brown gravelly clay
48 to 58 inches—brown gravelly clay loam
Substratum:
58 to 60 inches—strong brown very gravelly sandy clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Stomar soils on slightly lower positions
- Zacharias soils on lower positions
- Fine textured soils that are very gravelly throughout
- Areas that have been severely cut and filled

Similar inclusions:
- Areas with a surface layer of clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Orchard crops
Major management factors: Surface rock fragments, restricted permeability
• Surface rock fragments cause rapid wear of tillage equipment.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Livestock Grazing

Common plants on the Damluis soil: Soft chess, filaree, wild oats
Major management factors: Gravelly moderately fine surface layer
• Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Shrink-swell, restricted permeability, low strength
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The leach lines should follow the contour lines to maintain proper grade.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2s-4, irrigated; 4s-4, nonirrigated
MLRA: 17
Ecological site: Fine loamy
Vegetative soil group: C

303—Damluis gravelly clay loam, 2 to 8 percent slopes

Setting

Landform: Uplifted dissected terraces
Elevation: 200 to 400 feet
Slope features: Undulating to gently rolling
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Damluis gravelly clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Damluis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer: And upper part of subsoil
0 to 20 inches—dark grayish brown gravelly clay loam
Subsoil:
20 to 48 inches—dark grayish brown and brown gravelly clay
48 to 58 inches—brown gravelly clay loam
Substratum:
58 to 60 inches—strong brown very gravelly sandy clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Low to high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Arburua soils on higher positions
• Chaqua soils on higher positions
• Zacharias soils on lower positions
• Fine textured soils that are very gravelly throughout
• Areas that have been severely cut and filled
Similar inclusions:
• Damluis soils on 8 to 15 percent slopes on slightly higher positions
• Areas with a surface layer of very gravelly clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Orchard crops
Major management factors: Slope, runoff, surface rock fragments, restricted permeability
• All tillage should be on the contour or across the slope.
• Surface rock fragments cause rapid wear of tillage equipment.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Sprinkler and drip irrigation systems are suited to this unit.
• Use of this method permits the even, controlled application of water, and reduces runoff.

Livestock Grazing

Common plants on the Damluis soil: Soft chess, filaree, wild oats
Major management factors: Gravelly moderately fine surface layer
• Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Slope, hazard of water erosion, shrink-swell, restricted permeability, low strength
• Excavation for roads and buildings increases the hazard of water erosion.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The leach lines should follow the contour lines to maintain proper grade.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2e-4, irrigated; 4e-4, nonirrigated
MLRA: 17
Ecological site: Fine loamy
Vegetative soil group: C

304—Damluis gravelly clay loam, 8 to 15 percent slopes

Setting

Landform: Uplifted dissected terraces
Elevation: 200 to 400 feet
Slope features: Rolling
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Damluis gravelly clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Damluis soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer: And upper part of subsoil
0 to 20 inches—dark grayish brown gravelly clay loam
Subsoil:
20 to 48 inches—dark grayish brown and brown gravelly clay
48 to 58 inches—brown gravelly clay loam
Substratum:
58 to 60 inches—strong brown very gravelly sandy clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Medium or high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Arburua soils on higher positions
• Chaqua soils on higher positions
• Zacharias soils on lower positions
• Fine textured soils that are very gravelly throughout and areas that have been severely cut and filled
Similar inclusions:
• Damluis soils on 2 to 8 percent slopes on slightly lower positions
• Areas with a surface layer of very gravelly clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Orchard crops
Major management factors: Slope, Hazard of water erosion, surface rock fragments, restricted permeability
• All tillage should be on the contour or across the slope.
• When soil is bare, erosion can be reduced by crop residue management or the establishment of a cover crop.
• Surface rock fragments cause rapid wear of tillage equipment.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Sprinkler and drip irrigation systems are suited to this unit.
• Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Livestock Grazing

Common plants on the Damluis soil: Soft chess, filaree, wild oats
Major management factors: Gravelly moderately fine surface layer
• Trampling by livestock can occur when the soil is too swet, which reduces productivity and increases runoff.

Homesite Development

Major management factors: Slope, hazard of water erosion, shrink-swell, restricted permeability, low strength
• Excavation for roads and buildings increases the hazard of water erosion.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

• The leach lines should follow the contour lines to maintain proper grade.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 3e-4, irrigated; 4e-4, nonirrigated
MLRA: 17
Ecological site: Fine loamy
Vegetative soil group: C

310—Deldota clay, 0 to 2 percent slopes

Setting

Landform: Low alluvial fans
Elevation: 90 to 300 feet
Landscape features: Drainage has been improved by levees and reclamation projects.
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Deldota clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Deldota soil

Parent material: Alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 18 inches—brown and grayish brown clay
Subsoil:
18 to 23 inches—yellowish brown clay
23 to 60 inches—light yellowish brown and yellowish brown clay and clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3.5 to 5 feet below the soil surface, from December through March
Kind of water table: Perched
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.1
Surface runoff: Negligible to medium
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Hazard of soil blowing in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Capay soils in concave positions
• Dosamigos soils on lower positions
• Stomar soils on higher positions
• Vernalis soils on higher positions
Similar inclusions:
• Areas with a surface layer of clay loam

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: High water table, fine surface texture, restricted permeability
• Irrigation must be carefully managed to avoid raising the water table.
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, shrink-swell, restricted permeability, low strength.
• Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 2w-5, irrigated; 4w-5, nonirrigated
MLRA: 17
Vegetative soil group: C

320—Dosamigos clay loam, 0 to 2 percent slopes

Setting

Landform: Low alluvial fans
Elevation: 90 to 180 feet
Landscape features: Redoximorphic features in the profile indicate a somewhat poorly drained soil. However, levees and reclamation projects have lowered the water table.
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Dosamigos clay loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Dosamigos soil

Parent material: Alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 15 inches—grayish brown clay loam
Subsoil:
15 to 42 inches—brown clay
Substratum:
42 to 60 inches—pale brown and light yellowish brown clay loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Somewhat poorly drained
Water table: 3.5 to 5 feet below the soil surface, from December through March
Kind of water table: Perched
Available water capacity: High
Most restrictive permeability: Very slow
Intake family: 0.1
Surface runoff: Negligible to high
Salinity:
0 to 15 inches—0 to 2
15 to 42 inches—2 to 8
42 to 60 inches—2 to 16
Sodicity (SAR):
0 to 15 inches—5 to 10
15 to 42 inches—10 to 30
42 to 60 inches—10 to 30
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Capay soils in concave positions
- Deldota soils on similar positions
- Stomar soils on higher positions
- Vernalis soils on higher positions

Similar inclusions:
- Dosamigos soils that lack a perched water table
- Areas with a surface layer of clay

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: High water table, fine surface texture, sodicity and salinity, restricted permeability
- Irrigation water needs to be applied carefully to prevent the buildup of a depth to water table.
- The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
- Intensive management is required to reduce the salinity and maintain soil productivity.
- Sodicity and salinity limitations can be overcome by toxic salt reduction and the application of soil amendments.
- The restricted permeability requires proper irrigation design with a low application rate and a longer application period to prevent stand deterioration.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border, and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, sodicity and salinity, shrink-swell, restricted permeability, low strength
- Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
- Salt-tolerant species are most suitable for planting.
- The effect of shrinking and swelling can be

minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation

Interpretive Groups

Capability classification: Dosamigos—3w-6, irrigated; 6w, nonirrigated
MLRA: 17
Vegetative soil group: F

330—Pedcat clay loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Low alluvial fans
Landscape features: Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Elevation: 60 to 90 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Pedcat clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Pedcat soil

Parent material: Alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 7 inches—dark grayish brown and grayish brown clay loam
Subsoil:
7 to 25 inches—brown and yellowish brown clay
25 to 51 inches—yellowish brown and light yellowish brown clay loam
Substratum:
51 to 60 inches—light yellowish brown stratified sandy clay loam to clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3.5 to 5 feet below the soil surface, from December through March
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Very slow
Intake family: 0.5
Surface runoff: Low to high
Salinity:
0 to 7 inches—0 to 2
7 to 25 inches—0 to 4
25 to 51 inches—8 to 16
51 to 60 inches—0 to 4
Sodicity (SAR):
0 to 7 inches—0 to 2
7 to 25 inches—2 to 5
25 to 51 inches—12 to 50
51 to 60 inches—5 to 12
Highest shrink swell potential: High
Hazard of flooding: Rare, for brief periods, from October through April
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Clear Lake soils on slightly lower positions
• Columbia soils on lower positions
• Dospalos soils on slightly lower positions
Similar inclusions:
• Areas with a surface layer of clay

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: High water table, fine textured surface, sodicity and salinity, restricted permeability
• Irrigation must be carefully managed to avoid raising the water table.
• The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
• Intensive management is required to reduce the salinity and maintain soil productivity.
• Sodicity and salinity limitations can be overcome by toxic salt reduction and the application of soil amendments.
• The restricted permeability requires an irrigation

design with low application rates and longer application periods to prevent stand deterioration and invasion of hydrophytic plants.
• Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
• Furrow, border, corrugation and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: Flooding, high water table, low strength, sodicity and salinity, restricted permeability, shrink-swell potential
• Flooding can occur during the winter and early spring months. The foundation should be taller than normal or the buildings located on the highest elevations. Water should be intercepted by drainage ditches or a drainage system should be developed around the foundation.
• Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• Sodicity and salinity limitations can be overcome by toxic salt reduction and the application of soil amendments.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 3w-6, irrigated; 4w-6, nonirrigated
MLRA: 17
Ecological site: Loamy saline alkali
Vegetative soil group: F

331—Pedcat clay loam, 0 to 2 percent slopes

Setting

Landform: Low alluvial fans
Landscape features: Redoximorphic features in the profile indicate a poorly drained soil. However, levees and reclamation projects have lowered the water table.
Elevation: 70 to 90 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Pedcat clay loam and similar soils: 90 percent
Dissimilar inclusions: 10 percent

Characteristics of the Pedcat soil

Parent material: Alluvium from sedimentary rock sources

Typical profile

Surface layer:
0 to 7 inches—dark grayish brown and grayish brown clay loam
Subsoil:
7 to 25 inches—brown clay
25 to 51 inches—yellowish brown and light yellowish brown clay loam
Substratum:
51 to 60 inches—light yellowish brown stratified sandy clay loam to clay
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Poorly drained
Water table: 3.5 to 5 feet from December through March
Kind of water table: Apparent
Available water capacity: Moderate
Most restrictive permeability: Very slow
Intake family: 0.5
Surface runoff: Low to high
Salinity:
0 to 7 inches—0 to 2
7 to 25 inches—0 to 4
25 to 51 inches—8 to 16
51 to 60 inches—0 to 4
Sodicity (SAR):
0 to 7 inches—0 to 2
7 to 25 inches—2 to 5
25 to 51 inches—12 to 50
51 to 60 inches—5 to 12
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight

Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Clear Lake soils on slightly lower positions
- Columbia soils on lower positions
- Dospalos soils on slightly lower positions

Similar inclusions:
- Areas with a surface layer of clay

Use and Management

Irrigated Crops

Commonly grown crops: Row and field crops
Major management factors: High water table, fine textured surface, sodicity and salinity, restricted permeability
- Irrigation must be carefully managed to avoid raising the water table
- The soil is too sticky to cultivate when it is wet and is too hard to cultivate when it is dry.
- Intensive management is required to reduce the salinity and maintain soil productivity.
- Sodicity and salinity limitations can be overcome by toxic salt reduction and the application of soil amendments.
- The restricted permeability requires an irrigation design with low application rates and longer application periods to prevent stand deterioration and invasion of hydrophytic plants.
- Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.
- Furrow, border, corrugation and sprinkler irrigation systems are suited to this unit.

Homesite Development

Major management factors: High water table, low strength, sodicity and salinity, restricted permeability, shrink-swell potential
- Because of the wetness of the soil profile in the winter and early spring months, a drainage system should be developed around the foundation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- Sodicity and salinity limitations can be overcome by toxic salt reduction and the application of soil amendments.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- When septic tanks are used, a high water table limits the absorption capacity of the leach field. A mounded leach field or other specialized leach field can overcome this limitation.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 3w-6, irrigated; 4w-6, nonirrigated
MLRA: 17
Vegetative soil group: F

340—Carranza-Woo complex, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 150 to 240 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Carranza gravelly clay loam and similar soils: 45 percent
Woo clay loam and similar soils: 25 percent
Dissimilar inclusions: 30 percent

Characteristics of the Carranza Soil

Parent material: Alluvium dominantly from sedimentary rock

Typical profile

Surface layer:
0 to 10 inches—brown gravelly clay loam
Subsoil:
10 to 38 inches—brown gravelly clay loam
Substratum:
38 to 60 inches—yellowish brown stratified extremely gravelly sandy loam to loamy sand
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Depth to unconsolidated material with rock fragments: 35 to 40 inches
Natural drainage class: Well drained
Available water capacity: Moderate
Most restrictive permeability: Moderate over rapid substratum
Intake family: 0.5

Surface runoff: Negligible to low
Highest shrink swell potential: Moderate
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Woo Soil

Parent material: Alluvium from sedimentary rock

Typical profile

Surface layer:
0 to 19 inches—brown clay loam
Subsurface layer:
19 to 41 inches—yellowish brown clay loam
Substratum:
41 to 62 inches—stratified pale brown gravelly sandy loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow over moderately rapid substratum
Intake family: 0.5
Surface runoff: Negligible to low
Highest shrink swell potential: Low
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Xerofluvents
• Xerorthents
• Zacharias clay loam
Similar inclusions:
• Carranza soils without an extremely gravelly substratum
• Woo soils without an extremely gravelly substratum

Use and Management

Irrigated Crops

Commonly grown crops: Apricots, walnuts, cantaloupe, cotton, and plums
Major management factors: Carranza—surface rock fragments, coarse textured underlying material; Woo—few limitations
• Surface rock fragments cause rapid wear of tillage equipment.
• The high percentage of gravel in Carranza soil reduces the amount of moisture available for plant growth.
• Soils with coarse textured underlying material require short and frequent irrigation cycles to prevent deep percolation losses and ground water contamination.

Homesite Development

Major management factors: Carranza—low strength; Woo—poor filter, low strength
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The coarse texture limits filtering capacity. Inadequately filtered effluent can contaminate the surface or ground water. Special designs can overcome this limitation
• As the density of homesites increase, a community disposal system should be considered.

Interpretive Groups

Capability classification: 2s-11, irrigated; 4s-11, nonirrigated
MLRA: 17
Vegetative soil group: C

350—Woo loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Elevation: 90 to 150 feet
Slope features: Nearly level
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Woo loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Woo Soil

Parent material: Alluvium dominantly from sedimentary rock

Typical profile

Surface layer:
0 to 16 inches—brown loam
Substratum:
16 to 67 inches—yellowish brown clay loam and light yellowish brown loam
Depth class: Very deep
Depth to bedrock: Greater than 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Moderately slow

Intake family: 0.5
Surface runoff: Low
Highest Shrink-swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Carranza soils with an extremely gravelly substratum
- Xerofluvents
- Xerorthents
- Zacharias clay loam

Similar inclusions:
- Woo soils with an extremely gravelly substratum

Use and Management

Irrigated Crops

Commonly grown crops: Apricots, walnuts, cantaloupe, cotton, and plums
Major management factors: Few limitations

Homesite Development

Major management factors: Restricted permeability, low strength
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Interpretive Groups

Capability classification: 1, irrigated; 4c—11, nonirrigated
MLRA: 17
Vegetative soil group: D

400—Alo-Vaquero complex, 8 to 30 percent slopes

Setting

Landform: Mountains (figure 8)
Elevation: 800 to 1,600 feet
Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 270 days

Composition

Alo clay and similar soils: 45 percent
Vaquero clay and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Alo soil

Parent material: Shale

Typical profile

Surface layer:
0 to 12 inches—dark grayish brown clay
Subsoil:
12 to 35 inches—grayish brown clay
Bedrock:
35 inches—brown highly weathered shale
Depth class: Moderately deep
Depth to bedrock: 24 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Slow
Surface runoff: Medium to very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate to severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Vaquero soil

Parent material: Shale

Typical profile

Surface layer:
0 to 6 inches—grayish brown clay
Subsoil:
6 to 35 inches—brown clay
Bedrock:
35 inches—variegated light gray and grayish brown highly weathered shale
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Slow
Surface runoff: Medium to very high
Highest shrink swell potential: Very high
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate to severe
Corrosivity class: Steel—high; concrete— high

Minor Components

Dissimilar inclusions:
- Arburua soils on convex positions near the top of slopes

Figure 8.—Soil slipping in an area of Alo-Vaquero complex, 8 to 30 percent slopes, on a mountain.

- Wisflat soils on convex positions near the top of slopes
- San Timoteo soils on convex positions near the top of slopes

Similar inclusions:

- Soils that have a surface layer of silty clay

Use and Management

Livestock Grazing

Common plants: Wild oats, soft chess, filaree, burclover

Major management factors: Hazard of water erosion, fine surface texture, shrink-swell

- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Because of the fine surface texture, trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.
- Areas of this unit are difficult to fence.
- High shrinking and swelling of the soil can cause the tilting or lifting out of fence posts.

Homesite Development

Major management factors: Slope, hazard of water erosion, depth to rock, shrink-swell, slumping, restricted permeability, low strength

- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Cutbanks are not stable and are subject to slumping.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The leach lines should follow the contour lines to maintain proper grade.
- The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their

placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.
• Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 4e-3, nonirrigated
MLRA: 15
Ecological site: Clayey
Vegetative soil group: G

401—Alo-Vaquero complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 800 to 1,600 feet
Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 270 days

Composition

Alo clay and similar soils: 45 percent
Vaquero clay and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Alo soil

Parent material: Shale

Typical profile

Surface layer:
0 to 12 inches—dark grayish brown clay
Subsoil:
12 to 35 inches—grayish brown clay
Bedrock:
35 inches—brown highly weathered shale
Depth class: Moderately deep
Depth to bedrock: 24 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Vaquero soil

Parent material: Shale

Typical profile

Surface layer:
0 to 6 inches—grayish brown clay
Subsoil:
6 to 35 inches—brown clay
Bedrock:
35 inches—variegated light gray and grayish brown highly weathered shale
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: Very high
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete— high

Minor Components

Dissimilar inclusions:
• Arburua soils on convex positions near the top of slopes
• Wisflat soils on convex positions near the top of slopes
• San Timoteo soils on convex positions near the top of slopes
Similar inclusions:
• Alo on 15 to 30 percent slopes on slightly lower positions
• Vaquero soils on 15 to 30 percent slopes on slightly lower positions
• Soils that have a surface layer of silty clay

Use and Management

Livestock Grazing

Common plants: Wild oats, soft chess, filaree, burclover
Major management factors: Hazard of water erosion, fine surface texture, shrink-swell
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable

vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

- Because of the fine surface texture, trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.
- Areas of this unit are difficult to fence.
- High shrinking and swelling of the soil can cause the tilting or lifting out of fence posts.

Homesite Development

Major management factors: Slope, hazard of water erosion, depth to rock, shrink-swell, slumping, restricted permeability, low strength

- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Cutbanks are not stable and are subject to slumping.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The leach lines should follow the contour lines to maintain proper grade.
- The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.
- Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 15
Ecological site: Clayey
Vegetative soil group: G

410—Ayar clay, 30 to 50 percent slopes

Setting

Landform: Foothills
Elevation: 300 to 900 feet
Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Ayar clay and similar soils: About 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Ayar soil

Parent material: Calcareous shale and sandstone

Typical profile

Surface layer:
0 to 15 inches—grayish brown clay
Subsoil:
15 to 26 inches—grayish brown clay
26 to 47 inches—yellowish brown clay
Bedrock:
47 inches—strongly weathered shale
Depth class: Deep
Depth to bedrock: 40 to 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Arburua loam on sideslopes
- Damluis clay, 2 to 8 percent slopes, on toe slopes
- Franciscan sandy loam on sideslopes
- Wisflat sandy loam on ridges
- Oneil silt loam on sideslopes

Similar inclusions:
- Ayar clay, 5 to 30 percent slopes

Use and Management

Livestock Grazing

Common plants: Red brome, filaree, needlgrass, clover
Major management factors: Slope, water erosion hazard, fine surface texture

- If the soil is grazed to a bare condition, the loss of the surface layer by water erosion results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing.
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.

Proper grazing management is necessary to maintain sufficient cover to control erosion.
• Proper grazing management is necessary to maintain sufficient cover to control erosion.
• Trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 15
Ecological site: Clayey low elevation
Vegetative soil group: D

420—Ayar-Oneil complex, 30 to 50 percent slopes

Setting

Landform: Foothills
Elevation: 300 to 900 feet
Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Ayar clay and similar inclusions: About 50 percent
Oneil silt loam and similar inclusions: About 35 percent
Dissimilar inclusions: 15 percent

Characteristics of the Ayar soil

Parent material: Calcareous shale and sandstone

Typical profile

Surface layer:
0 to 15 inches—grayish brown clay
Subsoil:
15 to 47 inches—grayish brown and yellowish brown clay
Bedrock:
47 inches—strongly weathered shale
Depth class: Deep
Depth to bedrock: 40 to 60 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Oneil soil

Parent material: Calcareous shale and sandstone

Typical profile

Surface layer:
0 to 14 inches—brown silt loam
Subsoil:
14 to 30 inches—dark yellowish brown and yellowish brown silt loam
Bedrock:
30 inches—unweathered calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Moderate
Most restrictive permeability: Moderately slow
Surface runoff: Moderate to high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
• Arburua loam on sideslopes
• Damluis clay, 2 to 8 percent slopes, on toe slopes
• Franciscan sandy loam on sideslopes
• Wisflat sandy loam on sideslopes
Similar inclusions:
• Ayar clay, 5 to 30 percent slopes
• Oneil silt loam, 15 to 30 percent slopes

Use and Management

Livestock Grazing

Common plants: Ayar—red brome, filaree, needlgrass, clover; Oneil—soft chess, wild oats, filaree, ripgut brome
Major management factors: Ayar—slope, water erosion hazard, fine surface texture; Oneil—slope, water erosion hazard
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• If the soil is grazed to a bare condition, the loss of the surface layer by water erosion results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing.
• Proper grazing management is necessary to maintain sufficient cover to control erosion.
• Trampling by livestock can occur when the soil is

too wet, which reduces productivity and increases runoff.

Interpretive Groups

Capability classification: Ayar—6e, nonirrigated; Oneil—7e, nonirrigated
MLRA: 15
Ecological site: Ayar—clayey low elevation; Oneil—Fine loamy
Vegetative soil group: Ayar—C; Oneil—F

430—Vaquero-Carbona complex, 8 to 30 percent slopes

Setting

Landform: Vaquero—mountains; Carbona—sideslopes of uplifted dissected terraces
Elevation: 400 to 1,200 feet
Slope features: Rolling to hilly
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 250 to 270 days

Composition

Vaquero clay and similar soils: 50 percent
Carbona clay loam and similar soils: 35 percent
Dissimilar inclusions: 15 percent

Characteristics of the Vaquero soil

Parent material: Shale

Typical profile

Surface layer:
0 to 6 inches—grayish brown clay
Subsoil:
6 to 35 inches—brown clay
Bedrock:
35 inches—variegated light gray and grayish brown highly weathered shale
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Slow
Surface runoff: Medium to very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate to severe
Corrosivity class: Steel—high; concrete— high

Characteristics of the Carbona soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 15 inches—dark grayish brown clay loam
Subsurface layer:
15 to 24 inches—dark grayish brown clay
Subsoil:
24 to 50 inches—brown and yellowish brown clay
Substratum:
50 to 60 inches—yellowish brown clay loam
Depth class: Very deep
Natural drainage class: Well drained
Depth to bedrock: Greater than 5 feet
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Slow
Intake family: 0.5
Surface runoff: Medium to very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate to severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Arburua soils on convex positions near the top of slopes
- Wisflat soils on convex positions near the top of slopes
- San Timoteo soils on convex positions near the top of slopes
- Very deep medium textured soils on alluvial fans
- Areas dissected by deep gullies with seeps
- Severely eroded shallow medium textured soils on similar positions

Similar inclusions:
- Soils that have a surface layer of silty clay

Use and Management

Livestock Grazing

Common plants: Vaquero—wild oat, soft chess, filaree, burclover; Carbona—wild oat, Mediterranean barley, filaree, burclover
Major management factors: Hazard of water erosion, fine surface texture, shrink-swell
- Loss of the surface layer results in a severe

decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Because of the fine surface texture, trampling by livestock can occur when the soil is too wet, which reduces productivity and increases runoff.
• Areas of this unit are difficult to fence.
• High shrinking and swelling of the soil can cause the tilting or lifting out of fence posts.

Homesite Development

Major management factors: Vaquero—slope, hazard of water erosion, depth to rock, shrink-swell, slumping, restricted permeability, low strength; Carbona—slope, hazard of water erosion, shrink-swell, restricted permeability, low strength
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• Cutbanks are not stable and are subject to slumping.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The leach lines should follow the contour lines to maintain proper grade.
• The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.
• Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 4e-3, nonirrigated
MLRA: 15 and 17
Ecological site: Clayey
Vegetative soil group: Vaquero—G; Carbona—C

500—Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 500 to 2,300 feet
Slope features: Steep
Vegetation: Annual grasses, forbs, and perennial shrubs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Wisflat sandy loam and similar soils: 35 percent
Arburua loam and similar soils: 30 percent
San Timoteo sandy loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Wisflat soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Arburua soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 6 inches—grayish brown loam
Subsoil:
6 to 22 inches—grayish brown and light brownish gray loam

Bedrock:
22 to 24 inches—light gray strongly weathered calcareous sandstone
24 inches—white hard calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the San Timoteo soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 5 inches—grayish brown sandy loam
Underlying material:
5 to 22 inches—brown sandy loam
Bedrock:
22 inches—yellowish brown strongly weathered calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Somewhat excessively drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately rapid
Surface runoff: Medium
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Ayar soils on similar positions
• Dark gray sandy soils less than 6 inches deep to more than 40 inches deep
• Rock outcrop on convex positions near the top of slopes
Similar inclusions:
• Arburua soils on 50 to 75 percent slopes on slightly higher positions and on 15 to 30 percent toe slopes
• Wisflat soils on 50 to 75 percent slopes on slightly higher positions and on 15 to 30 percent toe slopes
• San Timoteo soils on 50 to 75 percent slopes on slightly higher positions and on 15 to 30 percent toe slopes
• Soils that have a surface layer of gravelly loam or clay loam

Use and Management

Livestock Grazing

Common plants: Wislfat—soft chess, wild oats, filaree, California sagebrush; Arburua—soft chess, foxtail fescue, filaree, blue oak; San Timoteo—soft chess, wild oats, California sagebrush
Major management factors: Wisflat—hazard of water erosion, depth to rock, limited available water capacity; Arburua—hazard of water erosion, limited available water capacity; San Timoteo—hazard of water erosion, limited available water capacity

• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Homesite Development

Major management factors: Wisflat—slope, hazard of water erosion, depth to rock; Arburua—slope, hazard of water erosion, depth to rock; San Timoteo—slope, hazard of water erosion, depth to rock
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• The leach lines should follow the contour lines to maintain proper grade.
• Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
• The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their

placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.

Interpretive Groups

Capability classification: Wisflat—7e, nonirrigated; Arburua—6e, nonirrigated; San Timoteo—6e, nonirrigated
MLRA: 15
Ecological site: Wisflat—coarse loamy; Arburua—fine loamy; San Timoteo—coarse loamy
Vegetative soil group: G

501—Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Landscape features: Gullies about 200 to 300 feet apart are characteristic of this unit
Elevation: 500 to 2,300 feet
Slope features: Very steep
Vegetation: Annual grasses, forbs, and perennial shrubs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Wisflat sandy loam and similar soils: 35 percent
Arburua loam and similar soils: 30 percent
San Timoteo sandy loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Wisflat soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Arburua soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 6 inches— brown loam
Subsoil:
6 to 22 inches—grayish brown and light grayish brown loam
Bedrock:
22 to 24 inches—light gray strongly weathered calcareous sandstone
24 inches—white hard calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Surface runoff: High
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Hazard of soil blowing in bare areas: Slight
Corrosivity class: Steel—high; concrete—low

Characteristics of the San Timoteo soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 5 inches—light brownish gray sandy loam
Underlying material:
5 to 22 inches—pale brown loam
Bedrock:
22 inches—yellowish brown strongly weathered calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Somewhat excessively drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately rapid
Surface runoff: Medium
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Hazard of soil blowing in bare areas: Slight

Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Ayar soils on similar positions
- Dark gray sandy soils less than 6 inches deep to more than 40 inches deep
- Rock outcrop on convex positions near the top of slopes

Similar inclusions:
- Arburua soils on 30 to 50 percent slopes on slightly lower positions
- Wisflat soils on 30 to 50 percent slopes on slightly lower positions
- San Timoteo soils on 30 to 50 percent slopes on slightly lower positions
- Soils that have a surface layer of gravelly loam or clay loam

Use and Management

Livestock Grazing

Common plants: Wislfat—soft chess, wild oats, filaree, California sagebrush; Arburua—soft chess, foxtail fescue, filaree, blue oak; San Timoteo—soft chess, wild oats, California sagebrush
Major management factors: Wisflat—slope, hazard of water erosion, depth to rock, limited available water capacity; Arburua—slope, hazard of water erosion, limited available water capacity; San Timoteo—slope, hazard of water erosion, limited available water capacity
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Wisflat—coarse loamy; Arburua—fine loamy; San Timoteo—coarse loamy
Vegetative soil group: G

502—Arburua-Wisflat complex, 8 to 15 percent slopes

Setting

Landform: Mountains
Elevation: 1,000 to 1,600 feet
Slope features: Rolling
Vegetation: Annual grasses and forbs.
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Arburua loam and similar soils: 55 percent
Wisflat sandy loam and similar soils: 25 percent
Dissimilar inclusions: 20 percent

Characteristics of the Arburua soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 6 inches— brown loam
Subsoil:
6 to 22 inches—grayish brown and light grayish brown loam
Bedrock:
22 to 24 inches—light gray strongly weathered calcareous sandstone
24 inches—white hard calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Surface runoff: Low or medium
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Characteristics of the Wisflat soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Alo soils on concave positions
- Ayar soils on concave positions
- Zacharias soils on slightly lower positions
- Dark gray sandy soils less than 6 inches deep
- Rock outcrop on convex positions near the top of slopes

Similar inclusions:
- Arburua soils on 15 to 30 percent slopes on sideslopes
- Wisflat soils on 15 to 30 percent slopes on sideslopes
- Soils that have a surface layer of clay loam

Use and Management

Livestock Grazing

Common plants: Arburua—soft chess, foxtail fescue, filaree, blue oak; Wislfat—soft chess, wild oats, filaree, California sagebrush
Major management factors: Arburua—hazard of water erosion; Wisflat—hazard of water erosion, depth to rock, limited available water capacity
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Areas of this unit are difficult to fence because of the depth to bedrock.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Homesite Development

Major management factors: Arburua—slope, hazard of water erosion, depth to rock, restricted permeability; Wisflat—slope, hazard of water erosion, depth to rock
- Excavation for roads and buildings increases the hazard of water erosion.
- Cuts needed to provide essentially level building sites can expose bedrock.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
- The leach lines should follow the contour lines to maintain proper grade.
- Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
- Enlarging septic tank absorption fields or using specially designed sewage disposal systems helps to minimize the limitation caused by depth to bedrock.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: Arburua—4e-8, nonirrigated; Wisflat-7e, nonirrigated
MLRA: 15
Ecological site: Arburua—fine loamy; Wisflat—coarse loamy
Vegetative soil group: G

505—Arburua-Contra Costa-Wisflat complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 500 to 2,300 feet
Slope features: Steep
Vegetation: Annual grasses, forbs, scattered oaks and perennial shrubs
Mean annual precipitation: 10 to 13 inches

Mean annual temperature: 60 to 62 degrees
Frost-free period: 230 to 250 days

Composition

Arburua loam and similar soils: 35 percent
Contra Costa clay loam and similar soils: 30 percent
Wisflat sandy loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Arburua soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 6 inches— brown loam
Subsoil:
6 to 22 inches—grayish brown and light grayish brown loam
Bedrock:
22 to 24 inches—light gray strongly weathered calcareous sandstone
24 inches—white hard calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Contra Costa soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 9 inches—brown clay loam
Subsoil:
9 to 38 inches—brown and light brown clay loam
Bedrock:
38 inches—light yellowish brown hard sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of the Wisflat soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• San Timoteo soils on slightly higher positions and on toe slopes
• Rock outcrop on convex positions near the top of slopes and on toe slopes near drainage areas
Similar inclusions:
• Arburua on 50 to 75 percent slopes on slightly higher positions and 15 to 30 percent slopes on toe slopes
• Wisflat on 50 to 75 percent slopes on slightly higher positions and 15 to 30 percent slopes on toe slopes
• A soil similar to Arburua that is noncalcareous

Use and Management

Livestock Grazing

Common plants: Arburua—soft chess, foxtail fescue, filaree, blue oak; Contra Costa—soft chess, wild oats, filaree, burclover; Wislfat—soft chess, wild oats, filaree, California sagebrush
Major management factors: Arburua—hazard of water erosion, limited available water capacity; Contra Costa—hazard of water erosion; Wisflat—hazard of water erosion, depth to rock, limited available water capacity
• Loss of the surface layer results in a severe

decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• The steep topography and the resulting runoff reduces the amount of rainfall that enters the soil.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Homesite Development

Major management factors: Arburua—slope, depth to rock; Contra Costa—slope, depth to rock, low strength, restricted permeability, shrink-swell; Wisflat—slope, depth to rock
• Excavation for roads and buildings increases the hazard of water erosion.
• Cuts needed to provide essentially level building sites can expose bedrock.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• The leach lines should follow the contour lines to maintain proper grade.
• The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: Arburua and Contra Costa—6e, nonirrigated; Wisflat—7e, nonirrigated
MLRA: 15
Ecological site: Arburua—fine loamy; Contra Costa—clayey; Wisflat—coarse loamy (15e)
Vegetative soil group: G

506—Arburua-Contra Costa-Wisflat complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 500 to 2,300 feet
Slope features: Very steep
Vegetation: Annual grasses, forbs, scattered oaks, and perennial shrubs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 50 to 62 degrees F
Frost-free period: 230 to 250 days

Composition

Arburua loam and similar soils: 35 percent
Contra Costa clay loam and similar soils: 30 percent
Wisflat sandy loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Arburua soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 6 inches—grayish brown loam
Subsoil:
6 to 22 inches—grayish brown and light grayish brown loam
Bedrock:
22 to 24 inches—light gray strongly weathered calcareous sandstone
24 inches—white hard calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Contra Costa soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 9 inches—brown clay loam
Subsoil:
9 to 38 inches—brown and light brown clay loam
Bedrock:
38 inches—light yellowish brown hard sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of the Wisflat soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- San Timoteo soils on 30 to 50 percent on toe slopes.
- Rock outcrop on convex positions near the top of slopes

Similar inclusions:
- Arburua soils on 30 to 50 percent on toe slopes
- Wisflat soils on 30 to 50 percent on toe slopes

Use and Management

Livestock Grazing

Common plants: Arburua—soft chess, foxtail fescue, filaree, blue oak; Contra Costa—soft chess, wild oats, filaree, burclover; Wislfat—soft chess, wild oats, filaree, California sagebrush
Major management factors: Arburua—slope, hazard of water erosion, limited available water capacity; Contra Costa—slope, hazard of water erosion; Wisflat—slope, hazard of water erosion, depth to rock, limited available water capacity
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- The very steep topography and the resulting runoff reduces the amount of rainfall that enters the soil.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Arburua—fine loamy; Contra Costa—clayey; Wisflat—coarse loamy
Vegetative soil group: G

510—Arburua-Wisflat-Rock outcrop complex, 30 to 65 percent slopes

Setting

Landform: Mountains
Elevation: 600 to 1,400 feet
Slope features: Steep to very steep

Vegetation: Annual grasses, forbs, scattered oaks and perennial shrubs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 230 to 250 days

Composition

Arburua loam and similar soils: 45 percent
Wisflat sandy loam and similar soils: 30 percent
Rock outcrop: 15 percent
Dissimilar inclusions: 10 percent

Characteristics of the Arburua soil

Parent material: Calcareous sandstone
Position on landscape: North-facing slopes

Typical profile

Surface layer:
0 to 6 inches—grayish brown loam
Subsoil:
6 to 22 inches—grayish brown and light grayish brown loam
Bedrock:
22 to 24 inches—light gray strongly weathered calcareous sandstone
24 inches—white hard calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Wisflat soil

Parent material: Sandstone
Position on landscape: Ridge tops and south-facing slopes

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of Rock outcrop

Parent material: Sandstone
Position on landscape: Occurs randomly throughout the area

Minor Components

Dissimilar inclusions:
• Contra Costa soils on toe slopes and on north-facing slopes
• San Timoteo soils on 15 to 30 percent slopes on toe slopes
Similar inclusions:
• Arburua soils on 15 to 30 percent slopes on toe slopes
• Wisflat soils on 15 to 30 percent slopes on toe slopes
• Arburua soils on 15 to 30 percent slopes on toe slopes
• A soil similar to Wisflat but has a fine sandy loam surface layer
• A soil similar to Wisflat but is less than 6 inches deep
• A soil similar to Arburua but is noncalcareous

Use and Management

Livestock Grazing

Common plants: Arburua—soft chess, foxtail fescue, filaree, blue oak; Wislfat—soft chess, wild oats, filaree, California sagebrush
Major management factors: Arburua—slope, hazard of water erosion, limited available water capacity; Wisflat—slope, hazard of water erosion, depth to rock, limited available water capacity
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Forage production is limited by shallow rooting

depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Arburua—6e, nonirrigated; Wisflat—7e, nonirrigated; Rock outcrop—8, nonirrigated
MLRA: 15
Ecological site: Arburua—fine loamy; Wisflat—coarse loamy
Vegetative soil group: G

520—Wisflat-Rock outcrop complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 500 to 1,600 feet
Slope features: Steep
Vegetation: Perennial shrubs, annual grasses, and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Wisflat sandy loam and similar soils: 45 percent
Rock outcrop: 35 percent
Dissimilar inclusions: 25 percent

Characteristics of the Wisflat soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of Rock outcrop

Parent material: Exposed sandstone and shale

Minor Components

Dissimilar inclusions:
- Arburua soils on 50 to 70 percent slopes on slightly higher positions and on 15 to 30 percent on toe slopes
- San Timoteo soils on 50 to 70 percent slopes on slightly higher positions and on 15 to 30 percent on toe slopes
- One to six inches of loamy soil material over rock

Similar inclusions:
- Wisflat soils on 50 to 70 percent slopes on slightly higher positions and on 15 to 30 percent on toe slopes

Use and Management

Livestock Grazing

Common plants on the Wislfat soil: Soft chess, wild oats, filaree, California sagebrush
Major management factors: Hazard of water erosion, depth to rock, limited available water capacity.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Wisflat—7e, nonirrigated; Rock outcrop—8, nonirrigated

MLRA: 15
Ecological site: Wisflat—coarse loamy
Vegetative soil group: Wisflat—G

521—Wisflat-Rock outcrop complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 500 to 1,600 feet
Slope features: Very steep
Vegetation: Perennial shrubs, annual grasses, and forbs
Mean annual precipitation: 10 to 13 inches
Mean annual temperature: 60 to 62 degrees
Frost-free period: 260 to 280 days

Composition

Wisflat sandy loam and similar soils: 45 percent
Rock outcrop: 35 percent
Dissimilar inclusions: 20 percent

Characteristics of the Wisflat soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—pale brown sandy loam
Underlying material:
5 to 10 inches—light yellowish brown sandy loam
Bedrock:
10 to 13 inches—light yellowish brown strongly weathered sandstone
13 inches—light gray hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Characteristics of Rock outcrop

Parent material: Exposed sandstone and shale

Minor Components

Dissimilar inclusions:
• Arburua soils on 50 to 70 percent slopes on slightly higher positions and on 15 to 30 percent toe slopes
• San Timoteo soils on 50 to 70 percent slopes on slightly higher positions and on 15 to 30 percent toe slopes
• One to six inches of loamy soil material over rock
Similar inclusions:
• Wisflat soils on 50 to 70 percent slopes on slightly higher positions and on 15 to 30 percent toe slopes

Use and Management

Livestock Grazing

Common plants on the Wislfat soil: Soft chess, wild oats, filaree, California sagebrush
Major management factors: Slope, hazard of water erosion, depth to rock, limited available water capacity.
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Wisflat—7e, nonirrigated; Rock outcrop—8, nonirrigated
MLRA: 15
Ecological site: Wisflat—coarse loamy
Vegetative soil group: Wisflat—G

530—Oneil silt loam, 15 to 30 percent slopes

Setting

Landform: Foothills
Elevation: 300 to 1,200 feet
Slope features: Hilly
Vegetation: Annual grasses and forbs

Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 230 to 250 days

Composition

Oneil silt loam and similar soils: 75 percent
Dissimilar inclusions: 25 percent

Characteristics of the Oneil soil

Parent material: Calcareous sandstone and shale

Typical profile

Surface layer:
0 to 14 inches—brown silt loam
Subsoil:
14 to 30 inches—dark yellowish brown and yellowish brown silt loam
Bedrock:
30 inches—unweathered calcareous sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately slow
Surface runoff: Medium or high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Alo clay on toe slopes
- Arburua loam on similar positions
- Ayar clay toe slopes
- Damluis clay loam on toe slopes
- Rock outcrop on ridges
- Wisflat sandy loam on sideslopes

Similar inclusions:
- Oneil silt loam, 8 to 15 and 30 to 50 percent slopes

Use and Management

Livestock Grazing

Common plants: Soft chess, wild oats, filaree
Major management factors: Water erosion hazard
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 15 and 17
Ecological site: Fine loamy
Vegetative soil group: F

540—Oquin fine sandy loam, 15 to 30 percent slopes

Setting

Landform: Low foothills
Elevation: 250 to 500 feet
Slope features: Hilly
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 62 degrees F
Frost-free period: 260 to 280 days

Composition

Oquin fine sandy loam and similar inclusions: About 75 percent
Dissimilar inclusions: 25 percent

Characteristics of the Oquin soil

Parent material: Calcareous sandstone

Typical profile

Surface layer:
0 to 24 inches—grayish brown fine sandy loam
Substratum:
24 to 31 inches—light brownish gray sandy loam
Bedrock:
31 to inches—strongly weathered sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately rapid
Surface runoff: Low to medium
Highest shrink swell potential: Low
Hazard of water erosion in bare areas: Moderate
Hazard of flooding: None
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Oneil silt loam, 15 to 50 percent slopes on similar positions
- Rock outcrop near ridge tops

• San Timoteo sandy loam, 15 to 30 percent slopes, on similar positions
• Wisflat sandy loam, 15 to 30 percent slopes, on sideslopes
Similar inclusions:
• Soils similar to Oquin soil but are 40 to 60 inches deep or have slopes of 8 to 15 percent on toe slopes

Use and Management

Livestock Grazing

Common plants on the Oquin soil: Soft chess, wild oats, red brome, filaree
Major management factors: Water erosion hazard
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from further erosion.

Interpretive Groups

Capability classification: 4e-1, nonirrigated
MLRA: 15
Ecological site: Coarse loamy
Vegetative soil group: F

600—Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 800 to 3,300 feet
Slope features: Steep
Vegetation: Annual grasses, forbs, and blue oaks
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Gonzaga loam and similar soils: 35 percent
Honker sandy loam and similar soils: 30 percent
Franciscan gravelly sandy loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Gonzaga soil

Position on landscape: Dominantly north-facing slopes
Parent material: Shale

Typical profile

Surface layer:
0 to 18 inches—brown loam
Subsoil:
18 to 29 inches—brown gravelly loam
29 to 38 inches—yellowish red gravelly clay
Bedrock:
38 inches—light yellowish brown hard shale
Depth class: Moderately deep
Depth to claypan: 20 to 30 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Honker soil

Position on landscape: Dominantly south-facing slopes on knolls
Parent material: Sandstone
Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Franciscan soil

Position on landscape: Dominantly north-facing slopes
Parent material: Sandstone

Typical profile

Surface layer:
0 to 14 inches—brown gravelly sandy loam

Subsoil:
14 to 29 inches—brown cobbly clay loam
Bedrock:
29 inches—brown hard sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately slow
Surface runoff: High
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Rock outcrop on convex positions near the top of slopes
- Vallecitos soils on convex positions near the top of slopes

Similar inclusions:
- Soils that have a surface layer of gravelly loam, gravelly clay loam or clay loam
- Franciscan soils on slopes greater than 50 percent or less than 30 percent on similar positions
- Gonzaga soils on slopes greater than 50 percent or less than 30 percent on similar positions
- Honker soils on slopes greater than 50 percent or less than 30 percent on similar positions

Use and Management

Livestock Grazing

Common plants: Gonzaga—soft chess, wild oats, foxtail fescue, blue oak; Honker—wild oats, soft chess, filaree; Franciscan—soft chess, ripgut brome, filaree, blue oak
Major management factors: Gonzaga—hazard of water erosion, runoff, limited available water capacity; Honker—hazard of water erosion, runoff, depth to claypan, limited available water capacity; Franciscan—hazard of water erosion, limited available water capacity
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 15
Ecological site: Gonzaga—loamy (blue oak); Honker—clayey; Franciscan—loamy (blue oak)
Vegetative soil group: Gonzaga and Honker—D; Franciscan—G

601—Gonzaga-Honker-Franciscan complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 800 to 3,300 feet
Slope features: Very steep
Vegetation: Annual grasses, forbs, and blue oaks
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Gonzaga loam and similar soils: 35 percent
Honker sandy loam and similar soils: 30 percent
Franciscan gravelly sandy loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Gonzaga soil

Position on landscape: Dominantly north-facing slopes
Parent material: Shale

Typical profile

Surface layer:
0 to 18 inches—brown loam
Subsoil:
18 to 29 inches—brown gravelly loam
29 to 38 inches—yellowish red gravelly clay
Bedrock:
38 inches—light yellowish brown hard shale
Depth class: Moderately deep
Depth to claypan: 20 to 30 inches

Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Honker soil

Position on landscape: Dominantly south-facing slopes on knolls
Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Franciscan soil

Position on landscape: Dominantly north-facing slopes
Parent material: Sandstone

Typical profile

Surface layer:
0 to 14 inches—brown gravelly sandy loam
Subsoil:
14 to 29 inches—brown cobbly clay loam
Bedrock:
29 inches—brown hard sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately slow
Surface runoff: High
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Rock outcrop
• Vallecitos soils on convex positions near the top of slopes
Similar inclusions:
• Soils that have a surface layer of gravelly loam, gravelly clay loam or clay loam
• Franciscan soils on slopes less than 50 percent on similar positions
• Gonzaga soils on slopes less than 50 percent on similar positions
• Honker soils on slopes less than 50 percent on similar positions

Use and Management

Livestock Grazing

Common plants: Gonzaga—soft chess, wild oats, foxtail fescue, blue oak; Honker—wild oats, soft chess, filaree; Franciscan—soft chess, ripgut brome, filaree, blue oak
Major management factors: Gonzaga—slope, hazard of water erosion, runoff, limited available water capacity, depth to claypan; Honker—slope, hazard of water erosion, runoff, depth to claypan; Franciscan—slope, hazard of water erosion, limited available water capacity
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This

will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Gonzaga—loamy (blue oak); Honker—clayey; Franciscan—loamy (blue oak)
Vegetative soil group: Gonzaga and Honker—D; Franciscan—G

610—Honker-Vallecitos-Honker, eroded, complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Position on landscape: Dominantly south-facing slopes
Elevation: 800 to 3,300 feet
Slope features: Steep
Vegetation: Annual grasses, forbs, and perennial shrubs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Honker sandy loam and similar soils: 35 percent
Vallecitos gravelly loam and similar soils: 30 percent
Honker gravelly loam, eroded, and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Honker soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Vallecitos soil

Parent material: Metamorphosed sandstone

Typical profile

Surface layer:
0 to 7 inches—pale brown gravelly loam
Subsoil:
7 to 16 inches—brown gravelly clay
Bedrock:
16 inches—reddish brown hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the eroded Honker soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 4 inches—light brownish gray gravelly loam
Subsoil:
4 to 29 inches—light red gravelly clay
Bedrock:
29 inches—reddish brown hard sandstone
Depth class: Moderately deep
Depth to claypan: 5 to 10 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Gonzaga soils on toe slopes
- Franciscan soils on similar positions
- Rock outcrop on convex positions near the top of slopes

Similar inclusions:
- Soils that have a surface layer of gravelly clay loam or clay loam
- Honker soils on slopes greater than 50 percent or less than 30 percent on similar positions
- Vallecitos soils on slopes greater than 50 percent or less than 30 percent on similar positions

Use and Management

Livestock Grazing

Common plants: Honker—wild oats, soft chess, filaree; Vallecitos—soft chess, wild oats, foxtail fescue, ripgut brome, California sagebrush; Honker, eroded—red brome, California sagebrush, foxtail fescue, black sage
Major management factors: Honker—hazard of water erosion, runoff, depth to claypan; Vallecitos—hazard of water erosion, runoff, depth to claypan, depth to rock, limited available water capacity; Honker, eroded—hazard of water erosion, runoff, depth to claypan
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Honker—6e, nonirrigated; Vallecitos—6e, nonirrigated; Honker, eroded—7e, nonirrigated
MLRA: 15
Ecological site: Honker—clayey; Vallecitos—loamy; Honker, eroded—loamy (California sagebrush)
Vegetative soil group: Honker and Honker, eroded—D; Vallecitos—G

611—Honker-Vallecitos-Honker, eroded, complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Position on landscape: Dominantly south-facing slopes
Elevation: 800 to 3,300 feet
Slope features: Very Steep
Vegetation: Annual grasses, forbs, and perennial shrubs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 230 to 250 days

Composition

Honker sandy loam and similar soils: 35 percent
Vallecitos gravelly loam and similar soils: 30 percent
Honker gravelly loam, eroded, and similar soils: 20 percent

Characteristics of the Honker soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
High water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Vallecitos soil

Parent material: Metamorphosed sandstone

Typical profile

Surface layer:
0 to 7 inches—pale brown gravelly loam
Subsoil:
7 to 16 inches—brown gravelly clay
Bedrock:
16 inches—reddish brown hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the eroded Honker soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 4 inches—light brownish gray gravelly loam
Subsoil:
4 to 29 inches—light red gravelly clay
Bedrock:
29 inches—reddish brown hard sandstone
Depth class: Moderately deep
Depth to claypan: 5 to 10 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Franciscan soils on similar positions
- Gonzaga soils on similar positions
- Rock outcrop on convex positions near the top of slopes

Similar inclusions:
- Soils that have a surface layer of gravelly clay loam or clay loam
- Honker soils on slopes less than 50 percent on similar positions
- Vallecitos soils on slopes less than 50 percent on similar positions

Use and Management

Livestock Grazing

Common plants: Honker—wild oats, soft chess, filaree; Vallecitos—soft chess, wild oats, foxtail fescue, ripgut brome, California sagebrush; Honker, eroded—red brome, California sagebrush, foxtail fescue, black sage
Major management factors: Honker—slope, hazard of water erosion, runoff, depth to claypan; Vallecitos—slope, hazard of water erosion, runoff, depth to claypan, depth to rock, limited available water capacity; Honker, eroded—slope, hazard of water erosion, runoff, depth to claypan
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Honker—clayey; Vallecitos—loamy; Honker, eroded—loamy (California sagebrush)
Vegetative soil group: Honker and Honker, eroded—D; Vallecitos—G

612—Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 800 to 3,300 feet
Slope features: Steep
Vegetation: Annual grasses, forbs, and blue oak
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Honker sandy loam and similar soils: 30 percent
Vallecitos loam and similar soils: 30 percent
Gonzaga loam and similar soils: 25 percent
Dissimilar inclusions: 15 percent

Characteristics of the Honker soil

Position on landscape: South- and north-facing slopes
Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Vallecitos soil

Position on landscape: Dominantly south-facing slopes
Parent material: Metamorphosed sandstone

Typical profile

Surface layer:
0 to 7 inches—pale brown loam
Subsoil:
7 to 16 inches—brown clay loam and clay
Bedrock:
16 inches—reddish brown metamorphosed sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Gonzaga soil

Position on landscape: Dominantly north-facing slopes
Parent material: Shale

Typical profile

Surface layer:
0 to 18 inches—brown loam
Subsoil:
18 to 29 inches—brown gravelly loam
29 to 38 inches—yellowish red gravelly clay
Bedrock:
38 inches—light yellowish brown hard shale
Depth class: Moderately deep
Depth to claypan: 20 to 30 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Franciscan soils on similar positions
• Rock outcrop
• Honker eroded soils on convex positions near the top of slopes
Similar inclusions:
• Soils with a surface layer of gravelly clay loam or clay loam
• Honker soils on slopes greater than 50 percent or less than 30 percent on similar positions
• Vallecitos soils on slopes greater than 50 percent or less than 30 percent on similar positions

• Gonzaga soils on slopes greater than 50 percent or less than 30 percent on similar positions

Use and Management

Livestock Grazing

Common plants: Honker—wild oats, soft chess, filaree; Vallecitos—soft chess, wild oats, foxtail fescue, ripgut brome, California sagebrush; Gonzaga—soft chess, wild oats, foxtail fescue, blue oak
Major management factors: Honker—hazard of water erosion, runoff, depth to claypan, limited available water capacity; Vallecitos—hazard of water erosion, runoff, depth to claypan, depth to rock, limited available water capacity; Gonzaga—hazard of water erosion, runoff

• The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 15
Ecological site: Honker—clayey; Vallecitos—loamy; Gonzaga—loamy (blue oak)
Vegetative soil group: Honker and Gonzaga—D; Vallecitos—G

613—Honker-Gaviota complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 2,200 to 3,300 feet
Slope features: Steep
Vegetation: Perennial shrubs, annual grasses, and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Honker gravelly loam and similar soils: 50 percent
Gaviota gravelly loam and similar soils: 30 percent
Dissimilar inclusions: 20 percent

Characteristics of the Honker soil

Position on landscape: Mountain sideslopes
Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—brown gravelly loam
Subsoil:
5 to 20 inches—yellowish brown gravelly clay loam
20 to 36 inches—yellowish brown gravelly clay
Bedrock:
36 inches—reddish brown hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Gaviota soil

Position on landscape: Ridges and upper mountain sideslopes
Parent material: Sandstone

Typical profile

Surface layer:
0 to 10 inches—brown gravelly loam
Bedrock:
10 inches—pale brown sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low

Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Minor Components

Dissimilar inclusions:
- Franciscan soils on sideslopes
- Gonzaga soils on sideslopes
- Vallecitos soils on convex positions near ridges
- Rock outcrop

Similar inclusions:
- Soils with a surface layer of gravelly clay loam or clay loam
- Honker eroded soils on convex positions near the top of slopes
- Honker on slopes greater than 50 percent on similar positions
- Gaviota soils on slopes greater than 50 percent on similar positions

Use and Management

Livestock Grazing

Common plants: Honker—wild oats, soft chess, filaree; Gaviota—manzanita, California sagebrush, chamise, buckbrush
Major management factors: Honker—hazard of water erosion, runoff, depth to claypan; Gaviota—hazard of water erosion, runoff, depth to rock, limited available water capacity
- The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Honker—clayey; Gaviota—gravelly loamy (chamise)
Vegetative soil group: Honker—D; Gaviota—G

614—Honker-Gaviota complex, 50 to 70 percent slopes

Setting

Landform: Mountains
Elevation: 2,000 to 3,300 feet
Slope features: Very steep
Vegetation: Perennial shrubs, annual grasses, and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Honker gravelly loam and similar soils: 50 percent
Gaviota gravelly loam and similar soils: 30 percent
Dissimilar inclusions: 20 percent

Characteristics of the Honker soil

Position on landscape: Mountain sideslopes
Parent material: Sandstone

Typical profile

Surface layer:
0 to 5 inches—brown gravelly loam
Subsoil:
5 to 20 inches—yellowish brown gravelly clay loam
20 to 36 inches—yellowish brown gravelly clay
Bedrock:
36 inches—reddish brown hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Gaviota soil

Position on landscape: Ridges and upper mountain sideslopes
Parent material: Sandstone

Typical profile

Surface layer:
0 to 10 inches—brown gravelly loam
Bedrock:
10 inches—pale brown hard meta-sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Minor Components

Dissimilar inclusions:
• Franciscan soils on sideslopes
• Vallecitos on convex positions
• Gonzaga soils on sideslopes
• Rock outcrop and Honker eroded soils on convex positions near the top of slopes
Similar inclusions:
• Soils with a surface layer of gravelly clay loam or clay loam
• Honker soils on slopes less than 30 percent on similar positions
• Gaviota soils on slopes less than 30 percent on similar positions

Use and Management

Livestock Grazing

Common plants: Honker—wild oats, soft chess, filaree; Gaviota—manzanita, California sagebrush, chamise, buckbrush
Major management factors: Honker—slope, hazard of water erosion, runoff, depth to claypan; Gaviota—slope, hazard of water erosion, runoff, depth to rock, limited available water capacity;
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Honker—clayey; Gaviota—gravelly loamy (chamise)
Vegetative soil group: Honker—D; Gaviota—G

615—Honker-Quinto complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 600 to 1,900 feet
Slope feature: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 230 to 250 days

Composition

Honker sandy loam and similar soils: 45 percent
Quinto gravelly sandy loam and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of the Honker soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep

Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Quinto soil

Parent material: Sandstone conglomerate

Typical profile

Surface layer:
0 to 6 inches—yellowish brown gravelly sandy loam
Subsoil:
6 to 17 inches—brown gravelly sandy clay loam
Bedrock:
17 inches—sandstone conglomerate
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Somewhat excessively drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Millsholm loam, 30 to 50 percent slopes
- Rock outcrop
- Vallecitos soils on similar positions

Similar inclusions:
- Honker sandy loam 50 to 75 percent
- Quinto gravelly sandy loam 50 to 75 percent slopes

Use and Management

Livestock Grazing

Common plants: Honker—wild oats, soft chess, filaree; Quinto—soft chess, California buckwheat, red brome, California sagebrush
Major management factors: Honker—hazard of water erosion, runoff, depth to clay pan, and limited available water capacity; Quinto—slope, hazard of water erosion, runoff, depth to rock, and limited available water capacity
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Honker—6e, nonirrigated; Quinto—7e, nonirrigated
MLRA: 15
Ecological site: Honker—clayey; Quinto—shallow coarse loamy
Vegetative soil group: Honker—D; Quinto—G

620—Franciscan sandy loam, 50 to 70 percent slopes

Setting

Landform: Mountains
Position on landscape: Dominantly north-facing slopes
Elevation: 800 to 3,600 feet
Slope features: Very steep
Vegetation: Annual grasses, forbs, and blue oaks
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 200 to 240 days

Composition

Franciscan sandy loam and similar inclusions: About 80 percent
Dissimilar inclusions: 20 percent

Characteristics of the Franciscan soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 10 inches—grayish brown and brown sandy loam
Subsoil:
10 to 26 inches—brown sandy clay loam
26 to 38 inches—brown and strong brown gravelly sandy clay loam
Bedrock:
38 inches—fractured sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately slow
Surface runoff: High
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
- Ayar soils on toe slopes, mainly in the Quinto Creek area
- Gonzaga loam on toe slopes
- Quinto gravelly sandy loam on sideslopes
- Rock outcrop

Similar inclusions:
- Franciscan sandy loam, 30 to 50 percent slopes

Use and Management

Livestock Grazing

Common plants: Soft chess, ripgut brome, filaree, blue oak
Major management factors: Slope, hazard of water erosion, limited available water capacity
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Firewood Production

Major management factors: Slope, hazard of water erosion
- The steepness of slope limits the kinds of equipment that can be used in harvesting wood products.
- Maintaining the understory vegetation is essential in controlling erosion.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Loamy (blue oak)
Vegetative soil group: G

625—Franciscan-Quinto-Honker complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 800 to 3,600 feet
Slope feature: Very steep
Vegetation: Franciscan—annual grasses, forbs, and blue oak; Quinto and Honker—annual grasses, and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 200 to 240 days

Composition

Franciscan sandy loam and similar soils: 40 percent
Quinto gravelly sandy loam and similar soils: 25 percent
Honker sandy loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Franciscan soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 10 inches—grayish brown and brown sandy loam

Subsoil:
10 to 26 inches—brown sandy clay loam
26 to 38 inches—brown and strong brown gravelly sandy clay loam
Bedrock:
38 inches—fractured sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately slow
Surface runoff: High
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Quinto soil

Parent material: Sandstone conglomerate

Typical profile

Surface layer:
0 to 6 inches—yellowish brown gravelly sandy loam
Subsoil:
6 to 17 inches—brown gravelly sandy clay loam
Bedrock:
17 inches—sandstone conglomerate
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Somewhat excessively drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Honker soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep
Natural drainage class: Well drained
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Minor Components

Dissimilar inclusions:
- Gonzaga loam on toe slopes
- Millsholm loam on sideslopes and ridges
- Rock outcrop

Similar inclusions:
- Franciscan sandy loam 30 to 50 percent slopes
- Quinto gravelly sandy loam 30 to 50 percent slopes

Use and Management

Livestock Grazing

Common plants: Franciscan—soft chess, ripgut brome, filaree, blue oak; Quinto—soft chess, California buckwheat, red brome, California sagebrush; Honker—wild oats, soft chess, filaree
Major management factors: Franciscan—slope, hazard of water erosion; Quinto—slope, hazard of water erosion, depth to rock, limited available water capacity; Honker—slope, hazard of water erosion, depth to claypan

- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency,

intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
Ecological site: *Franciscan*—loamy (blue oak); Quinto—shallow coarse loamy; Honker—clayey
MLRA: 15
Vegetative soil group: Franciscan and Quinto—G; Honker—D

630—Millsholm-Honker-Rock outcrop complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 700 to 2,000 feet
Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 200 to 240 days

Composition

Millsholm loam and similar soils: 45 percent
Honker sandy loam and similar soils: 20 percent
Rock outcrop: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Millsholm soil

Parent material: Sandstone and shale

Typical profile

Surface layer and subsoil:
0 to 19 inches—pale brown over light yellowish brown loam
Bedrock:
19 inches—hard fractured shale
Depth class: Shallow
Natural drainage class: Well
Depth to bedrock: 10 to 20 inches
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Low
Hazard of water erosion in bare areas: Severe
Hazard of flooding: None
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of the Honker Soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
36 inches—hard sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well
Water table: Greater than 6 feet
Available water capacity: Low or moderate
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of water erosion in bare areas: Moderate
Hazard of flooding: None
Corrosivity class: Steel—moderate; concrete—low

Characteristics of Rock outcrop

Parent material: Exposed sedimentary rock
Position on landscape: Occurs randomly throughout the area

Minor Components

Dissimilar inclusions:
- Contra Costa loam on similar positions
- Quinto gravelly sandy loam, 40 to 75 percent slopes on ridges
- Vallecitos soils

Similar inclusions:
- Millsholm loam, 15 to 30 percent and 50 to 65 percent slopes
- Honker sandy loam, 50 to 65 percent slopes

Use and Management

Livestock Grazing

Common plants: Millsholm—soft chess, filaree, foxtail fescue; Honker—wild oats, soft chess, filaree
Major management factors: Millsholm—hazard of water erosion, runoff, depth to rock, and limited available water capacity; Honker—hazard of water erosion, runoff, depth to clay pan, and limited available water capacity
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Millsholm and Honker—6e, nonirrigated; Rock outcrop—class 8
MLRA: 15
Vegetative soil group: Millsholm—G; Honker—D
Ecological site: Millsholm—shallow loamy; Honker—clayey

631—Millsholm-Honker-Rock outcrop complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 700 to 2,000 feet
Slope feature: Very steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 200 to 240 days

Composition

Millsholm loam and similar soils: 45 percent
Honker sandy loam and similar soils: 20 percent
Rock outcrop: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Millsholm soil

Parent material: Sandstone and shale

Typical profile

Surface and subsoil:
0 to 19 inches—pale brown over light yellowish brown loam
Bedrock:
19 inches—hard fractured shale
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of the Honker soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—brown sandy loam
Subsoil:
7 to 16 inches—reddish brown clay loam
16 to 36 inches—red gravelly clay
Bedrock:
38 inches—sandstone
Depth class: Moderately deep
Depth to claypan: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of Rock outcrop

Position on the landscape: Occurs randomly throughout the area
Parent material: Exposed sedimentary rock

Minor Components

Dissimilar inclusions:
• Contra Costa loam on toe slopes
• Quinto gravelly sandy loam on sideslopes
• Vallecitos gravelly loam on sideslopes
Similar inclusions:
• Millsholm loam, 30 to 50 percent slopes
• Honker sandy loam, 30 to 50 percent slopes

Use and Management

Livestock Grazing

Common plants: Millsholm—soft chess, filaree, foxtail fescue; Honker—wild oats, soft chess, filaree
Major management factors: Millsholm—slope, hazard of water erosion, runoff, depth to rock, and limited available water capacity; Honker— slope, hazard

of water erosion, runoff, depth to clay pan, and limited available water capacity
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Millsholm and Honker—7e, nonirrigated; Rock outcrop—class 8
MLRA: 15
Vegetative soil group: Millsholm—G; Honker—D
Ecological site: Millsholm—shallow loamy; Honker—clayey

635—Millsholm loam, 50 to 65 percent slopes

Setting

Landform: Mountains
Elevation: 700 to 2,000 feet
Slope features: Very steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 200 to 240 days

Composition

Millsholm loam and similar inclusions: About 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Millsholm soil

Parent material: Sandstone and shale

Typical profile

Surface and subsoil:
0 to 19 inches—pale brown over light yellowish brown loam
Bedrock:
19 inches—hard fractured shale
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Severe
Corrosivity class: Steel—moderate; concrete—moderate

Minor Components

Dissimilar inclusions:
• Contra Costa loam on toe slopes
• Honker sandy loam on toe slopes
• Quinto gravelly sandy on sideslopes
• Rock outcrop on ridges
Similar inclusions:
• Soils similar to Millsholm soil but are 5 to 10 inches thick
• Millsolm loam, 30 to 50 percent slopes

Use and Management

Livestock Grazing

Common plants: Soft chess, filaree, foxtail fescue
Major management factors: Slope, hazard of water erosion, and limited available water capacity
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• The limited available water capacity makes it

important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Shallow loamy
Vegetative soil group: G

640—Quinto-Millsholm-Rock outcrop, 40 to 75 percent slopes

Setting

Landform: Mountains
Slope feature: Steep to very steep
Elevation: 600 to 3,400 feet
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 200 to 240 days

Composition

Quinto gravelly sandy loam and similar soils: 35 percent
Millsholm loam and similar soils: 30 percent
Rock outcrop: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Quinto soil

Parent material: Sandstone conglomerate

Typical profile

Surface layer:
0 to 6 inches—yellowish brown gravelly sandy loam
Subsoil:
6 to 17 inches—brown gravelly sandy clay loam
Bedrock:
17 inches—sandstone conglomerate
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Somewhat excessively drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very high
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Millsholm Soil

Parent material: Sandstone and shale

Typical profile

Surface and subsoil:
0 to 19 inches—pale brown over light yellowish brown loam
Bedrock:
19 inches—hard fractured shale
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderate
Surface runoff: Medium or high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: High
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of Rock outcrop

Position on the landscape: Occurs randomly throughout the area
Parent material: Exposed sedimentary rock

Minor Components

Dissimilar inclusions:
- Contra Costa loam on sideslopes
- Honker sandy loam on toe slopes
- Vallecitos soils on similar positions
- Wisflat sandy loam on similar positions

Similar inclusions:
- Quinto soils with slopes of 25 to 40 percent on toe slopes
- Millsholm soils with slopes of 25 to 40 percent on toe slopes

Use and Management

Livestock Grazing

Common plants: Quinto—soft chess, California buckwheat, red brome, California sagebrush; Millsholm—soft chess, filaree, foxtail fescue
Major management factors: Slope, hazard of water erosion, runoff, depth to rock, and limited available water capacity
- Slope may limit access of equipment and some classes of livestock. Fencing, water development,

and forage supplements can improve livestock distribution.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- The steep to very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Quinto and Millsholm—7e, nonirrigated; Rock outcrop—class 8, nonirrigated
MLRA: 15
Ecological site: Quinto—shallow coarse loamy; Millsholm—shallow loamy
Vegetative soil group: G

650—Quinto-Rock outcrop complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 500 to 3,300 feet
Slope features: Very steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees F
Frost-free period: 200 to 240 days

Composition

Quinto gravelly sandy loam and similar soils: About 50 percent
Rock outcrop and similar inclusions: About 25 percent
Dissimilar inclusions: 25 percent

Characteristics of the Quinto soil

Parent material: Sandstone conglomerate

Typical profile

Surface layer:
0 to 6 inches—yellowish brown gravelly sandy loam
Subsoil:
6 to 17 inches—brown gravelly sandy clay loam
Bedrock:
17 inches—sandstone conglomerate
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Somewhat excessively drained
Water table: Greater than 60 inches
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of Rock outcrop

Parent material: Exposed sandstone conglomerate and sandstone

Minor Components

Dissimilar inclusions:
- Millsholm loam, 40 to 75 percent slopes
- Gaviota loam, 50 to 75 percent slopes
- Vallecitos soils

Similar inclusions:
- Quinto gravelly sandy loam, 30 to 50 percent slopes

Use and Management

Livestock Grazing

Common plants on the Quinto soil: Soft chess, California buckwheat, red brome, California sagebrush
Major management factors: Slope, hazard of water erosion, runoff, depth to rock, and limited available water capacity
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

• The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Quinto—7e, nonirrigated; Rock outcrop—8, nonirrigated
MLRA: 15
Ecological site: Quinto—shallow coarse loamy
Vegetative soil group: Quinto—G

660—Gaviota loam, 30 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 1,500 to 2,700 feet
Slope features: Steep to very steep
Vegetation: Perennial shrubs, annual grasses, and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Gaviota loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Gaviota soil

Parent material: Hard sandstone

Typical profile

Surface layer:
0 to 10 inches—brown loam
Bedrock:
10 inches—pale brown hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Minor Components

Dissimilar inclusions:
• Honker soils on similar positions
• Vallecitos soils on similar positions
• Rock outcrop on convex positions near the top of slopes
Similar inclusions:
• Soils with a surface layer of gravelly clay loam, clay loam, or gravelly loam

Use and Management

Livestock Grazing

Common plants: Manzanita, California sagebrush, chamise, buckbrush
Major management factors: Slope, hazard of water erosion, depth to rock, limited available water capacity
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that the remaining desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• The steep to very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• Fence construction on shallow soils may require special designs.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated

MLRA: 15
Ecological site: Gravelly loamy (chamise)
Vegetative soil group: G

661—Gaviota gravelly loam, 30 to 75 percent slopes

Setting

Landform: Mountains
Elevation: 1,100 to 3,800 feet
Slope features: Steep to very steep
Vegetation: Perennial shrubs, annual grasses, and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 230 to 250 days

Composition

Gaviota gravelly loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Gaviota soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 10 inches—brown gravelly loam
Bedrock:
10 inches—pale brown hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately rapid
Surface runoff: Very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Minor Components

Dissimilar inclusions:
- Honker soils on similar positions
- Vallecitos soils on similar positions
- Rock outcrop on convex positions near the top of slopes

Similar inclusions:
- Soils with a surface layer of gravelly clay loam, clay loam, or loam

Use and Management

Livestock Grazing

Common plants: Manzanita, California sagebrush, chamise, buckbrush
Major management factors: Slope, hazard of water erosion, depth to rock, and limited available water capacity.
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that the remaining desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- The steep to very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- Fence construction on shallow soils may require special designs.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Gravelly loamy (chamise)
Vegetative soil group: G

682—Henneke-Hentine-Rock outcrop complex, 30 to 70 percent slopes

Setting

Landform: Mountains
Elevation: 1,200 to 3,000 feet
Slope features: Steep to very steep
Vegetation: Perennial shrubs, annual grasses, forbs, and California foothill pine
Mean annual precipitation: 16 to 18 inches
Mean annual temperature: 59 to 61 degrees

Frost-free period: 190 to 220 days

Composition

Henneke gravelly loam and similar soils: 35 percent
Hentine gravelly sandy loam and similar soils: 35 percent
Rock outcrop: 15 percent
Dissimilar inclusions: 15 percent

Characteristics of the Henneke soil

Parent material: Serpentine

Typical profile

Surface layer:
0 to 5 inches—reddish brown gravelly loam
Subsoil:
5 to 9 inches—dark reddish brown gravelly clay loam
9 to 19 inches—reddish brown very gravelly clay
Bedrock:
19 inches—pale green hard fractured serpentine
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—moderate

Characteristics of the Hentine soil

Parent material: Serpentine

Typical profile

Surface layer:
0 to 4 inches—brown loam
Subsoil:
4 to 17 inches—brown very gravelly clay loam
Bedrock:
17 inches—greenish gray hard fractured serpentine
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Hazard of soil blowing in bare areas: Slight
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of Rock outcrop

Parent material: Exposed serpentine

Minor Components

Dissimilar inclusions:
• Franciscan soils on similar positions
• Gaviota soils on convex positions near the top of slopes
• Vallecitos soils on convex positions near the top of slopes
Similar inclusions:
• Soils with a surface layer of loam or sandy loam

Use and Management

Livestock Grazing

Common plants on the Hentine and Henneke soils: Chamise, buckbrush, manzanita, California foothill pine
Major management factors: Slope, hazard of water erosion, runoff, depth to rock, limited available water capacity
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Fence construction on shallow soils may require special designs.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Hentine and Henneke—7e, nonirrigated; Rock outcrop—8
MLRA: 15
Ecological site: Hentine-gravelly loamy (chamise); Henneke—gravelly clayey (chamise)
Vegetative soil group: Hentine and Henneke—I

683—Hentine-Rock outcrop-Henneke complex, 30 to 70 percent slopes

Setting

Landform: Mountains
Elevation: 1,200 to 2,550 feet
Slope features: Steep to very steep
Vegetation: Perennial shrubs, annual grasses, forbs, and California foothill pine
Mean annual precipitation: 16 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 190 to 220 days

Composition

Hentine gravelly loam and similar soils: 35 percent
Rock outcrop: 35 percent
Henneke gravelly loam and similar soils: 20 percent
Dissimilar inclusions: 10 percent

Characteristics of the Hentine soil

Position on landscape: South- and west-facing sideslopes
Parent material: Serpentinized peridotite

Typical profile

Surface layer:
0 to 4 inches—brown loam
Subsoil:
4 to 17 inches—brown very gravelly clay loam
Bedrock:
17 inches—greenish gray hard fractured serpentinized peridotite
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of Rock outcrop

Position on landscape: Occurs randomly throughout the area
Parent material: Exposed serpentinized peridotite

Characteristics of the Henneke soil

Position on landscape: North- and east-facing sideslopes
Parent material: Serpentinized peridotite

Typical profile

Surface layer:
0 to 5 inches—reddish brown gravelly loam
Subsoil:
5 to 9 inches—dark reddish brown gravelly clay loam
9 to 19 inches—reddish brown very gravelly clay
Bedrock:
19 inches—pale green hard fractured serpentinized peridotite
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
- Franciscan soils on similar positions
- Gaviota soils on convex positions near the top of slopes
- Vallecitos soils on convex positions near the top of slopes
- Soils similar to Hentine or Henneke but are moderately deep on toe slopes of less than 30 percent and gravelly throughout

Similar inclusions:
- Soils with a surface layer of loam or sandy loam

Use and Management

Livestock Grazing

Common plants on the Hentine and Henneke soils: Chamise, buckbrush, manzanita, California foothill pine
Major management factors: Slope, hazard of water erosion, runoff, depth to rock, limited available water capacity

• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Fence construction on shallow soils may require special designs.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Hentine and Henneke—7e, nonirrigated; Rock outcrop—8
MLRA: 15
Ecological site: Hentine—gravelly loamy (chamise); Henneke—gravelly clayey (chamise)
Vegetative soil group: Hentine and Henneke—I

684—Hentine-Henneke complex, 30 to 70 percent slopes

Setting

Landform: Mountains
Elevation: 2,400 to 3,400 feet
Slope features: Steep to very steep
Vegetation: Perennial shrubs, annual grasses, forbs, and California foothill pine
Mean annual precipitation: 16 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 190 to 220 days

Composition

Hentine very cobbly loam and similar soils: 50 percent
Henneke gravelly loam and similar soils: 35 percent
Dissimilar inclusions: 15 percent

Characteristics of the Hentine soil

Position on landscape: South- and west-facing sideslopes
Rock fragments on surface: Less than 3 percent
Parent material: Serpentinized peridotite

Typical profile

Surface layer:
0 to 4 inches—dark brown very cobbly loam
Subsoil:
4 to 14 inches—dark brown very gravelly clay loam
Bedrock:
14 inches—dark brown hard fractured serpentinized peridotite
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of the Henneke soil

Position on landscape: North- and east-facing sideslopes
Parent material: Serpentinized peridotite

Typical profile

Surface layer:
0 to 5 inches—reddish brown gravelly loam
Subsoil:
5 to 9 inches—dark reddish brown gravelly clay loam
9 to 19 inches—reddish brown very gravelly clay
Bedrock:
19 inches—pale green hard fractured serpentinized peridotite
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate

Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—moderate

Minor Components

Dissimilar inclusions:
- Franciscan soils on similar positions
- Gaviota soils on convex positions near the top of slopes
- Vallecitos soils on convex positions near the top of slopes
- Soils similar to Hentine or Henneke but are moderately deep on toe slopes

Similar inclusions:
- Soils with a surface layer of loam or sandy loam
- Slopes of less then 30 percent with profiles gravelly throughout

Use and Management

Livestock Grazing

Common plants on the Hentine and Henneke soils: Chamise, buckbrush, manzanita, California foothill pine
Major management factors: Slope, hazard of water erosion, runoff, depth to rock, limited available water capacity
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Fence construction on shallow soils may require special designs.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Hentine—chamise—gravelly loamy (chamise); Henneke—gravelly clayey (chamise)
Vegetative soil group: I

685—Stonyford complex, 15 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 1,500 to 1,900 feet
Slope features: Hilly to steep
Vegetation: Perennial shrubs, annual grasses, forbs, and California foothill pine
Mean annual precipitation: 16 to 18 inches
Mean annual temperature: 58 to 60 degrees
Frost-free period: 240 to 260 days

Composition

Stonyford gravelly loam, 15 to 30 percent slopes and similar soils: 45 percent
Stonyford gravelly loam, 30 to 50 percent slopes and similar soils: 40 percent
Dissimilar inclusions: 15 percent

Characteristics of Stonyford gravelly loam, 15 to 30 percent slopes

Parent material: Igneous rock

Typical profile

Surface layer:
0 to 6 inches—brown gravelly loam
Subsoil:
6 to 17 inches—brown and light brown gravelly clay loam
Bedrock:
17 inches—white hard fractured igneous rock
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low or low
Most restrictive permeability: Moderately slow
Surface runoff: Medium to very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of Stonyford gravelly loam, 30 to 50 percent slopes

Parent material: Igneous rock

Typical profile

Surface layer:
0 to 6 inches—brown gravelly loam
Subsoil:
6 to 17 inches—brown and light brown gravelly clay loam
Bedrock:
17 inches—white hard fractured igneous rock
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low or low
Most restrictive permeability: Moderately slow
Surface runoff: Medium to very high
Hazard of flooding: None
Highest shrink swell potential: Low
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Minor Components

Dissimilar inclusions:
• Henneke soils on slopes of 30 to 70 percent on sideslopes
• Hentine soils on slopes of 30 to 70 percent on sideslopes
• Wisflat soils on similar positions
• Zacharias soils on toe slopes
Similar inclusions:
• Stonyford soils on 8 to 15 percent slopes and 50 to 75 percent slopes on slightly higher positions
• Soils with a surface layer of sandy loam or clay loam
• Soils similar to Stonyford but 20 to 40 inches to bedrock on concave toe slopes

Use and Management

Livestock Grazing

Common plants: Chamise, manzanita, ceonothus, California foothill pine, scrub oak
Major management factors: Slope, hazard of water erosion, depth to rock, limited available water capacity
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• The hilly to steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Fence construction on shallow soils may require special designs.
• Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
• The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Stonyford 15 to 30 percent slopes soil—6e, nonirrigated; Stonyford 30 to 50 percent slopes soil—7e, nonirrigated
MLRA: 15
Ecological site: Gravelly loamy (chamise)
Vegetative soil group: G

687—Hentine-Henneke-Rock outcrop complex, 30 to 70 percent slopes

Setting

Landform: Mountains
Elevation: 1,600 to 3,560 feet
Slope features: Steep to very steep
Vegetation: Perennial shrubs, annual grasses, forbs, and California foothill pine
Mean annual precipitation: 16 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 190 to 220 days

Composition

Hentine very cobbly loam and similar soils: 40 percent
Henneke gravelly loam and similar soils: 30 percent
Rock outcrop: 20 percent
Dissimilar inclusions: 10 percent

Characteristics of the Hentine soil

Position on landscape: South- and west-facing sideslopes
Rock fragments on surface: Less than 3 percent
Parent material: Serpentinized peridotite

Typical profile

Surface layer:
0 to 4 inches—dark brown very cobbly loam
Subsoil:
4 to 14 inches—dark brown very gravelly clay loam

Bedrock:
14 inches—dark brown hard fractured serpentinized peridotite
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Low
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—moderate

Characteristics of the Henneke soil

Position on landscape: North- and east-facing sideslopes
Parent material: Serpentinized peridotite

Typical profile

Surface layer:
0 to 5 inches—reddish brown gravelly loam
Subsoil:
5 to 9 inches—dark reddish brown gravelly clay loam
9 to 19 inches—reddish brown very gravelly clay
Bedrock:
19 inches—pale green hard fractured serpentinized peridotite
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Moderately slow
Surface runoff: High or very high
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—moderate

Characteristics of Rock outcrop

Parent material: Exposed serpentinized peridotite
Position on landscape: Occurs randomly throughout the area

Minor Components

Dissimilar inclusions:
- Franciscan soils on similar positions
- Gaviota soils on convex positions near the top of slopes
- Vallecitos on convex positions near the top of slopes

Similar inclusions:
- Soils with a surface layer of loam or sandy loam
- Soils that are similar to Hentine or Henneke but are on toe slopes of less then 30 percent, and gravelly throughout

Use and Management

Livestock Grazing

Common plants on the Hentine and Henneke soils: Chamise, buckbrush, manzanita, California foothill pine
Major management factors: Slope, hazard of water erosion, runoff, depth to rock, limited available water capacity
- Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
- The steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
- Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
- Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- Fence construction on shallow soils may require special designs.
- Forage production is limited by shallow rooting depth. When seeding is desired, consider species adapted to droughty conditions.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.

Interpretive Groups

Capability classification: Hentine and Henneke—7e, nonirrigated; Rock outcrop—8
MLRA: 15
Ecological site: Hentine—gravelly loamy (chamise); Henneke—gravelly clayey (chamise)
Vegetative soil group: Hentine and Henneke—I

690—Sehorn-Contra Costa complex, 30 to 50 percent slopes

Setting

Landform: Mountains
Elevation: 600 to 1,900 feet

Slope features: Steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 12 to 18 inches
Mean annual temperature: 59 to 62 degrees F
Frost-free period: 200 to 240 days

Composition

Sehorn clay and similar inclusions: About 50 percent
Contra Costa clay loam and similar inclusions: About 35 percent
Dissimilar inclusions: 15 percent

Characteristics of the Sehorn soil

Parent material: Sandstone and shale

Typical profile

Surface layer:
0 to 7 inches—yellowish brown clay
Subsoil:
7 to 26 inches—yellowish brown over light yellowish brown and strong brown clay
Bedrock:
26 inches—fractured shale
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 60 inches
Available water capacity: Low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: High
Corrosivity class: Steel—high; concrete—low

Characteristics of the Contra Costa soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 9 inches—brown clay loam
Subsoil:
9 to 38 inches—brown and light brown clay loam
Bedrock:
38 inches—light yellowish brown hard sandstone
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Corrosivity class: Steel—moderate; concrete—moderate
Hazard of water erosion: Severe
Hazard of flooding: None

Minor Components

Dissimilar inclusions:
• Ayar clay, 30 to 50 percent slopes in concave positions
• Millsholm loam, 30 to 50 percent slopes on ridges
Similar inclusions:
• Soils similar to Sehorn soil but are 40 to 60 inches deep to bedrock and are on north-facing slopes

Use and Management

Livestock Grazing

Common plants: Softchess, wild oats, filaree, burclover
Major management factors: Slope, hazard of water erosion, shrink-swell
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• If the soil is grazed to a bare condition, the loss of the surface layer by water erosion results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing.
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
• Excessive shrinking and swelling of the soil can cause the tilting or lifting out of fence posts.

Interpretive Groups

Capability classification: 6e, nonirrigated
MLRA: 15
Ecological site: Sehorn and Contra Costa—loamy
Vegetative soil group: G

695—Orognen sandy loam, 8 to 30 percent slopes

Setting

Landform: Uplifted dissected terraces
Elevation: 1,100 to 1,700 feet
Slope features: Strongly sloping to moderately steep
Vegetation: Annual grasses and forbs
Mean annual precipitation: 10 to 13 inches

Mean annual temperature: 59 to 62 degrees
Frost-free period: 230 to 250 days

Composition

Orognen sandy loam and similar soils: 85 percent
Dissimilar inclusions: 15 percent

Characteristics of the Orognen soil

Parent material: Alluvium from mixed rock sources

Typical profile

Surface layer:
0 to 5 inches—light brown sandy loam
5 to 19 inches—brown gravelly sandy clay loam
Subsoil:
19 to 47 inches—reddish brown and brown clay
47 to 60 inches—light brown gravelly clay loam
Depth class: Very deep
Depth to claypan: 10 to 19 inches
Depth to bedrock: Greater than 5 feet
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: High
Most restrictive permeability: Very slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Moderate
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Gonzaga soils on slopes greater than 30 percent on higher positions
• Honker soils on slopes greater than 30 percent on higher positions
• Vallecitos soils on slopes greater than 30 percent on higher positions
• Very deep medium textured very gravelly soils in dissected drainageways with accumulations of cobbles and stones on the surface
Similar inclusions:
• Soils with a surface layer of loam, gravelly loam or gravelly sandy loam

Use and Management

Livestock Grazing

Common plants: Wild oats, Mediterranean barley, foxtail fescue, filaree
Major management factors: Hazard of water erosion
• Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

Homesite Development

Major management factors: Slope, hazard of water erosion, low strength, shrink-swell, restricted permeability
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
• Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
• The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
• The leach lines should follow the contour lines to maintain proper grade.
• The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 4e-3 nonirrigated
MLRA: 15
Ecological site: Fine loamy
Vegetative soil group: D

700—Hytop-Franciscan-Vallecitos complex, 50 to 75 percent slopes

Setting

Landform: Mountains
Position on landscape: Dominantly on north-facing slopes
Elevation: 1,000 to 2,700 feet
Slope features: Very steep
Vegetation: Annual grasses, forbs, and blue oaks
Mean annual precipitation: 13 to 18 inches
Mean annual temperature: 59 to 61 degrees
Frost-free period: 220 to 240 days

Composition

Hytop loam and similar soils: 40 percent
Franciscan sandy loam and similar soils: 25 percent
Vallecitos loam and similar soils: 20 percent
Dissimilar inclusions: 15 percent

Characteristics of the Hytop soil

Parent material: Basalt

Typical profile

Surface layer:
0 to 11 inches—brown loam
Subsoil:
11 to 39 inches—yellowish red clay loam and reddish brown clay
Bedrock:
39 inches—brownish yellow and yellowish red weathered basalt
Depth class: Moderately deep
Depth to claypan: 7 to 20 inches
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Very slow
Surface runoff: Very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Characteristics of the Franciscan soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 10 inches—grayish brown and brown sandy loam
Subsoil:
10 to 26 inches—brown sandy clay loam
26 to 38 inches—brown and strong brown gravelly sandy clay loam
Bedrock:
38 inches—fractured sandstone and metamorphic rock
Depth class: Moderately deep
Depth to bedrock: 20 to 40 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Low
Most restrictive permeability: Moderately slow
Surface runoff: High
Highest shrink swell potential: Moderate
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—moderate; concrete—low

Characteristics of the Vallecitos soil

Parent material: Sandstone

Typical profile

Surface layer:
0 to 7 inches—pale brown gravelly loam
Subsoil:
7 to 16 inches—brown gravelly clay
Bedrock:
16 inches—reddish brown hard sandstone
Depth class: Shallow
Depth to bedrock: 10 to 20 inches
Natural drainage class: Well drained
Water table: Greater than 6 feet
Available water capacity: Very low
Most restrictive permeability: Slow
Surface runoff: High or very high
Highest shrink swell potential: High
Hazard of flooding: None
Hazard of water erosion in bare areas: Very severe
Corrosivity class: Steel—high; concrete—low

Minor Components

Dissimilar inclusions:
• Rock outcrop
• Gaviota soils on convex positions near the top of slopes
Similar inclusions:
• Franciscan soils on slopes greater than 75 percent or less than 50 percent on similar positions
• Hytop soils on slopes greater than 75 percent or less than 50 percent on similar positions
• Vallecitos soils on slopes greater than 75 percent or less than 50 percent on similar positions
• Soils with a surface layer of gravelly clay loam or clay loam

Use and Management

Livestock Grazing

Common plants on the Franciscan soil: Wild oats, soft chess, filaree, blue oak
Major management factors: Hytop—slope, hazard of water erosion, limited available water capacity; Franciscan—slope, hazard of water erosion; Vallecitos—slope, hazard of water erosion, limited available water capacity, and depth to rock
• Slope may limit access of equipment and some classes of livestock. Fencing, water development, and forage supplements can improve livestock distribution.
• The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soil.
• Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing.
• Grazing should be controlled so that desirable

vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.
- The limited available water capacity makes it important that the forage plants not be stressed too frequently or severely during the growing season. This will maintain the plants and maintain the moisture throughout the growing season. Grazing frequency, intensity, and duration can affect the composition of the plant community.
- Brush management improves areas of range that are producing woody shrubs at a level that decreases preferred forage plants.

Homesite Development

Major management factors: Hytop—slope, hazard of water erosion, depth to rock, low strength in the claypan, shrink swell, restricted permeability; Franciscan—slope, hazard of water erosion, depth to rock; Vallecitos—slope, hazard of water erosion, depth to rock, low strength, shrink swell, restricted permeability
- Excavation for roads and buildings increases the hazard of erosion.
- Cuts needed to provide essentially level building sites can expose bedrock.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.
- Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.
- The effect of shrinking and swelling can be minimized by using proper engineering designs or backfilling material that has a low shrink-swell potential.
- Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
- The leach lines should follow the contour lines to maintain proper grade.
- The depth to rock decreases soil depth for the filtering capacity of the leach fields or can prevent their placement. If the leach lines are placed too close to the bedrock, ground water may be contaminated by the effluent.
- The restricted permeability decreases the absorption capacity of the leach fields. Increasing the size of the leach field or using a specially designed system can overcome this limitation.

Interpretive Groups

Capability classification: 7e, nonirrigated
MLRA: 15
Ecological site: Hytop soil—clayey; Franciscan soil—loamy (blue oak); Vallecitos soil—loamy
Vegetative soil group: Hytop soil—D; Franciscan and Vallecitos soils—G

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil

maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Additional Farmland of Statewide Importance

This is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops.

Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable. In some States, additional farmlands of statewide importance may include tracts of land that have been designated for agriculture by State law.

The map units in the area that are considered additional farmland of statewide importance are listed in table 6. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Crops and Pasture

Major management practices

Michael A. McElhiney, District Conservationist, Natural Resources Conservation Service, helped prepare this section.

In the following paragraphs are discussed the major management practices applicable to the soils in this area that are suited to irrigated and nonirrigated crops. The major management concerns when farming the soils are maintaining or improving production and minimizing erosion.

Needed management practices include, but are not limited to *chiseling and subsoiling, conservation crop rotation, residue management, no-till and mulch till, conservation tillage, cover crop, excess water removal, hayland management, irrigation land leveling, irrigation water management, prescribed grazing, subsurface water removal, surface water control and toxic salt reduction.* Technical terms used in this section are defined in the glossary.

Chiseling and subsoiling are used to increase the effective rooting depth in soils that have a plowpan. Chiseling the plowpan will enhance permeability and internal drainage, help prevent a perched water table, and allow deeper root penetration. Chiseling will temporarily benefit clay soils, such as Clear Lake, Capay and El Solyo. However, these clay soils may rapidly return to their original condition.

Conservation cropping rotation consists of growing crops in combination with cultural and management practices. A successful cropping system is achieved if the crops and practices used provide benefits that more than offset the effects of soil depleting crops and deteriorating practices. Crop rotations are recommended on all tilled soils in the area.

On irrigated cropland, practices include the rotation of various row and field crops, and the return of crop residue to the soil. It may include using cover crops of grasses and legumes, adequate fertilization, and weed and pest control. Examples are corn and small grain in rotation or beans, tomatoes, and alfalfa in rotation.

On nonirrigated cropland, a summer fallow system is used for small grain production. This system consists of leaving land weed free during alternate summers to store moisture in the soil. This permits normal planting operations in tilled soil, and reduces the disease problems of continuous cropping. With advances in no-till grain drills, herbicides, and disease resistant wheat varieties it may be possible to produce a crop every year. A typical cropping sequence on Vernalis and Zacharias soils consist of small grain planted in the fall and harvested in early summer. The stubble remains standing until spring of the second year when it can be incorporated into the soil. During the second summer the field is fallowed and weeds are controlled by cultivation. Keeping as much residue as possible on the surface of the land during the rainy season will reduce the hazard of erosion on sloping soils. The use of subsurface tillage implements such as chisels, blade type sweeps, or rodweeders is recommended on soils that do not have a high gravel content near the surface.

Residue management, no-till, and *mulch till* involve keeping to a minimum the number of operations necessary to prepare a seedbed, plant the crop, control the weeds, and still maintain at least 30 percent of the soil surface covered by residue after planting. Excessive tillage operations tend to break

down soil structure, cause compaction, reduce soil organic matter, and could create a plowpan below the tilled layer. These conditions increase the hazards of soil erosion, decrease the soil's water intake capability, and restrict root penetration. Varying the depths of tillage operations will help to prevent the development of a plowpan. Combining tillage operations to reduce the number of trips over a field and delaying tillage operations while soils are wet are other important factors in maintaining soil tilth, preventing compaction and conserving energy. This type of tillage is particularly beneficial on the Salado, Vernalis and Zacharias soils.

Cover crops are needed in orchards and vineyards and on soils left fallow during the rainy season. Cover crops help maintain or increase water infiltration and allow for winter access for cultural operations. Cover crops help control erosion on sloping land and keep dust to a minimum that improves working conditions and discourages spider mites. During the spring, prior to the frost season, the cover crop can be mowed at a height of 2 to 4 inches to reduce possible frost damage to the crop. The cover crop should then be allowed to produce seed.

Residue management consists of returning crop residues to the soil. Residues returned to the soil help maintain soil tilth, organic matter, and fertility and help to reduce erosion. On soils with slopes greater than 2 percent and on soils subject to wind erosion, residue should be left on or near the soil surface during critical erosion periods. Organic matter influences the development and stabilization of soil structure and the general soil physical environment including increased infiltration and available water capacity.

It is particularly important that a supply of organic matter be continually returned to the soil. The easiest and most common way of doing this is to return the residues produced by the crops grown. High residue producing crops such as corn, oats, and wheat should make up for the low residue producing crops such as tomatoes and sugar beets in a cropping system. Other excellent sources of organic matter are prunings from orchards and vineyards, animal manure, and grasses and legumes.

Hayland management is needed on irrigated and nonirrigated hayland for soil protection and to provide for maximum production, maintaining a desirable plant community and extending the life of the planting. Practices needed in a hayland management program include irrigation water management, fertilization, and proper timing of mowing and baling activities when the soils are firm and dry enough to support the load.

When establishing irrigated hay crops, seed in early fall or spring into a firm seedbed. The first mowing should be delayed until the plants are well established. The spacing of borders on flood irrigated hayland should be in multiples of the cutting width of the mower to be used.

Irrigation land leveling is necessary to conserve irrigation water. It will help insure that irrigation water is applied uniformly to the entire field without any wet swales or dry ridges. In addition to better water management, land leveling will permit better field arrangements that will conserve labor, time and energy. Following the initial land leveling of a field the first crop to be planted should be an annual crop. This will give the filled areas a chance to settle and the field can be smoothed before planting a longer-lived crop.

Accurate land leveling is important. Laser guided equipment can be used to produce a very uniform grade. Large benefits can be realized by re-leveling periodically and by re-leveling fields that were leveled without the aid of laser equipment.

Irrigation water management is achieved by controlling the rate and timing of irrigation water application and the amount of water applied so that the needs of the crop for water are met in a planned and efficient manner. This will efficiently utilize the available water in the soil for desired crop response and minimize soil erosion. It will also control costly water losses and protect water quality. Irrigation methods used in the area are furrow, border, basin, sprinkler, and drip. Furrow and border irrigation is the most common in the area. Their use is limited to nearly level slopes. Sprinkler irrigation is common on orchards and on soils used to germinate tomatoes on leveled land. Basin irrigation is common on apricot orchards. Drip irrigation is used on some orchards in the area.

Prescribed grazing is needed to prevent soil deterioration, provide for maximum production, maintain a desirable plant community, and extend the life of pastures. Practices used in an irrigated pasture management program include irrigation water management, rotation grazing, fertilization, harrowing or dragging to scatter animal droppings, mowing as necessary to maintain uniform growth and weed control. Grazing when irrigating or when the soil is wet is not recommended. Grazing can start when plants are 8 to 10 inches high, and livestock should be removed when 3 to 4 inches of stubble remains.

Selection of an adaptable plant mixture when establishing a pasture is important. For most soils in the area, mixtures containing a perennial grass and trefoil or clover will produce an abundance of high-quality forage.

When nonirrigated pasture is established, annual

grasses and legumes should be used. During the establishment year grazing should not be permitted and annual weeds should be controlled.

After establishment, grazing should not start until plants are 4 to 6 inches high, and livestock should be removed when 2 to 4 inches of stubble remain. To maintain plant density, annual pastures should be managed so that sufficient plants produce seed to maintain a good stand.

Subsurface water removal is required on some soils to keep river seepage and low-quality water below the primary rooting zone of plants. Among the soils that may need subsurface drainage are Bolfar, Capay wet phase, Columbia, and Dello.

Subsurface drainage may be improved by constructing open drainage ditches or tile drains.

Proper drainage water disposal methods are needed to dispose of any poor-quality water that is collected by the drainage system. High-quality ground water should be protected from possible pollution by any drainage water that is of low quality.

Surface water control is needed where water from rainfall or irrigation is a problem in low lying areas, adjacent to levees, or at the lower end of irrigated fields. Excess surface water reduces crop production and may be controlled by shaping and grading, construction of open drain ditches, maintaining existing natural drainage ways, irrigation land leveling, irrigation tail water recovery systems, and irrigation water management. Among the soils that need surface water control are Capay, Clear Lake and Dospalos.

Protection from flooding is needed on all soils in the San Joaquin River flood plains in the area. All low lying soils along the San Joaquin River such as Bolfar, Columbia, Dello, and Dospalos require an extensive levee system with pumped outlets to provide flood protection and lower the water table.

Toxic salt reduction is needed on soils where salts rise to the surface and accumulate in the root zone over a period of several years. Leaching can reduce the content of soluble salts. Dospalos soils are examples of soils in the San Joaquin River area that can be affected by salinity if water in adjacent rivers and sloughs are of poor quality. If the soil has large amounts of sodium, the soil is considered to be sodic.

Applying proper amounts of soil amendments, returning crop residue to the soil and leaching will reduce some of the sodic properties. Pedcat soils are examples of soils that are affected by both salinity and sodicity. Intensive management is required to reduce salinity and sodicity in these soils to maintain soil productivity. Irrigation water needs to be applied carefully to prevent the buildup of a high water table. Drainage may also be needed.

Plants Best Suited to the Soils

Soils strongly influence the kind of crop and pasture plants that can be grown in the area. Where climate and topography do not change, crops that can be grown are related closely to the kind of soil.

The climate in the area favors a wide variety of crops, although the hazard of winter frosts makes growth of semitropical fruits such as citrus uncertain. The somewhat cooler temperatures and early fall rains also cause the area to be unsuitable for cotton or raisin grapes.

Field Crops

Irrigated field crops are grown on a variety of soils in the area. Silage corn, oats and wheat are grown on very deep soils with a high water table such as Clear Lake and Dospalos. The conservation practices necessary for sustained productivity includes surface and subsurface water removal systems. In these soils, leaching every 3 to 5 years can control salinity.

Alfalfa

Alfalfa does best on very deep, well drained soils such as the Vernalis or Zacharias soils. It also does well on soils such as Dospalos soils in areas where the water table is carefully managed and protection from flooding is provided. Alfalfa can drown out on soils that commonly flood, such as some areas of the Bolfar soils.

Vegetable Crops

Vegetable crops are grown on very deep soils such as Salado, Vernalis and Zacharias. In some areas subsurface water removal is required. Chiseling is a common practice to break up compacted layers. Rotation with field crops helps maintain tilth and reduce disease problems. Portable sprinkler systems that are used to germinate processing tomatoes are replaced by furrow irrigation as the crop develops.

Dryland Field Crops

Dryland field crops are grown on Vernalis and Zacharias soils. Slopes range from 2 to 5 percent and are irregular. When cultivated, these soils have a potential water erosion hazard. Runoff and sediment that accumulates in low areas can damage crops. Crop residue and good management practices will control most erosion problems.

Fruit and Nut Crops

Fruit and nut crops are best suited to very deep, medium textured soils in the area such as Vernalis and Zacharias soils. Many types of irrigation systems are

used including basin, border, furrow, drip and sprinkler. Orchard cover crops are commonly used in conjunction with sprinkler irrigation to improve water penetration, reduce erosion, reduce dust, improve access between irrigations during the winter season, and reduce excess tail water.

Pastures

Pasture species will do well on a wide variety of soils but are commonly grown on very deep soils with a high water table, such as Columbia and Clear Lake soils. Large portions of former pasturelands have been converted to silage crops for the dairy industry. Pasture is commonly irrigated with graded borders. Water management, fertilization, and rotational grazing are key management practices.

Yields per Acre

The average yields per acre that can be expected of the principal irrigated crops in a high level of management are shown in table 7. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; and effective use of crop residue, barnyard manure, and green manure crops.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 7 are grown in the area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

In table 8 the land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes (USDA, SCS, 1961).

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Depending on the capability class, all three levels may not be listed.

Capability classes, the broadest groups, are designated by the numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations that make them unsuitable for cultivation.

Class 8 soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one

class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6.

The numbers used to designate units within the subclass are as follows:

1.—Indicates that a problem or limitation is caused by slope or by actual or potential erosion hazard.

2.—Indicates that a problem or limitation of wetness is caused by poor drainage or flooding.

3.—Indicates that a problem or limitation of slow or very slow permeability of the subsoil or substratum is caused by a clayey subsoil or a substratum that is semiconsolidated.

4.—Indicates that a problem or limitation is caused by sandy or gravelly soils with a very low or low available water holding capacity.

5.—Indicates that a problem or limitation is caused by a fine-textured or very fine textured surface layer.

6.—Indicates that a problem or limitation is caused by sodicity or salinity.

7.—Indicates that a problem or limitation is caused by rocks, stones, or cobbles.

8.—Indicates that a problem or limitation exists in the root zone, which generally is less than 40 inches over massive bedrock and lacks moisture for plants.

9.—Indicates that a problem or limitation is caused by low or very low fertility, acidity, or toxicity that cannot be corrected by adding normal amounts of fertilizer, lime, or other amendments.

10.—Indicates that a problem or limitation is caused by stony, cobbly, or gravelly material in the substratum.

No unit designations are shown for class 1 soils since soil characteristics are similar for all soils in this class.

The irrigated and nonirrigated capability classification of each component is also given in the section "Detailed Soil Map Units". If the soil is not irrigable, only the nonirrigated capability classification is shown.

Major Land Resource Areas

The land capability classification system is further refined by designating the major land resource area (MLRA) of the soils. A land resource area is a broad geographic area that has a distinct combination of climate, topography, vegetation, land use, and general type of farming. Parts of two of these nationally designated areas are in the area (USDA, SCS, 1981). These areas and their numbers are Central California Coast Range, MLRA-15; and Sacramento and San Joaquin Valley, MLRA-17. The major land resource area number is the next paragraph after land capability class, subclass, or unit designation at the end of each map unit description in the section "Detailed Soil Map Units."

MLRA-15, Central California Coast Range

The mountains and hills of the Coast Range, which are in the western part of the survey area, are in this major land resource area. Most of the soils are shallow or moderately deep to bedrock and are steep or very steep.

The natural vegetation is mainly annual grasses and forbs in the lower elevations and/or dominantly southern slopes grading to mixed annual grasses, forbs, shrubs, and blue oak in the higher elevations and/or dominantly northern slopes. Elevation ranges from 90 to 3800 feet. The average annual precipitation is 10 to 18 inches. The average annual air temperature is 58 to 62 degrees F., and the average frost-free season is 190 to 280 days.

The part of the county in this resource area generally is used for livestock grazing. A few areas are used for more intensive purposes, such as off-highway vehicle recreation areas, homesite and industrial development. Throughout most of the area, the supply of ground water is very limited and stream flow is intermittent. Water for livestock is provided by stock ponds, which are in scattered areas. Water for domestic and industrial uses is limited in quantity and

poor in quality. This area provides valuable habitat for wildlife.

MLRA-17, Sacramento and San Joaquin Valley

The landforms at the lower elevations to the east of the Coast Range are in this major land resource area.

The natural vegetation in this area is mainly grasses and forbs. Elevation ranges from 25 to 400 feet. The average annual precipitation is 10 to 12 inches. The average annual air temperature is 60 to 62 degrees F., and the average frost-free season is 260 to 280 days.

The part of the county in this resource area generally is used for irrigated crops, including orchards, or for irrigated hay and pasture, livestock grazing, or urban development. A few areas are used for dryland crops, such as small grain. The main crops are alfalfa hay, almonds, tomatoes, lima beans apricots, walnuts, and sugar beets. Riparian areas and irrigated pastures provide valuable habitat for wildlife. Water for agricultural, domestic, and industrial uses is obtained from wells or nearby rivers and creeks or canals. Furrow, border, sprinkler, and level basin irrigation systems are used in most areas. Protection from flooding is needed during winter on the soils in basins, on basin rims, and on flood plains. The fine textured soils in basins and on basin rims have a high shrink-swell potential, which can cause structural damage to improperly designed buildings and roads.

Storie Index

By Melissa A. Oliva-Vargas, undergraduate intern and Randal J. Southard, Professor, Department of Land, Air, and Water Resources, University of California Davis.

The soils in the area are rated in table 9 according to the Storie index (Storie, 1933, 1976). This index expresses numerically the relative degree of suitability of a soil for general intensive agricultural uses at the time of the evaluation. The rating is based on soil characteristics and is obtained by evaluating soil surface and subsurface chemical and physical properties, as well as landscape surface features. Not considered in the rating are availability of water for irrigation, local climate, size and accessibility of mapped areas, distance to markets and other factors that might determine the desirability of growing certain plants in a given locality. Therefore, the index should not be used as the only indicator of land value. Where the local economic and geographic factors are known to the user, however, the Storie index may provide additional objective information for land tract value comparisons.

Four general factors are used in determining the index rating:

A—The permeability, available water capacity, and depth of the soil.

B—The texture of the surface soil.

C—The dominant slope of the soil body.

X—Other conditions more readily subject to management or modification by the land user.

In this area these conditions include drainage and flooding, salinity and alkalinity, fertility, acidity, erosion, and microrelief. For some soils, more than one of these X conditions are used in determining the rating. A rating of 100 percent expresses the most favorable, or ideal, condition for general crop production. Lower percentage ratings are assigned for less favorable conditions or characteristics. Factor ratings, in percentages, are selected from tables prepared from data and yields. Certain properties are assigned a range of values to allow for variations in the properties to plant growth and crop yields. Certain properties are assigned a range of values to allow for variations in the properties that affect the suitability of the soil for general agricultural purposes.

The index rating for a soil component of a map unit is obtained by multiplying the percentage rating values given to its four factors, A, B, C, and X. If more than one condition is recognized for the X factor for a soil, the value for each condition acts as a multiplier. Therefore any of the general factors or X factors conditions may dominate or control the final rating. As an example, consider the map unit El Solyo clay loam, wet, 0 to 2 percent slopes. The factors are A: 85 percent due to slow subsoil permeability, B: 85 percent for the clay loam surface texture, which may be sticky and difficult to cultivate when wet, C: 100 percent for nearly level landscape, and X: 90 percent due to an apparent water table at a depth of 2 to 4 feet due to irrigation. The product of A, B, C, and is 65 percent. Managing the depth of the water table by drainage and controlling irrigation application rates could alleviate limitations due to the high water table and increase the X factor to 100 percent. The Storie index would then be 72 percent.

If a map unit consists primarily of one named soil series (a consociation), the index rating for the named soil component equals the index rating for the map unit. If a map unit consists of more than one named component (a complex), rating are assigned to each named component (soil series or miscellaneous area, such as Rock outcrop) and a weighted map unit index is calculated from the component indexes and the proportion of each of the named components in the map unit. Miscellaneous areas are considered to be

unsuited for agriculture, and are assigned a rating of zero. Inclusions of other soils, not named in the map unit name, are ignored in the calculations.

Map units are assigned grades according to their suitability for general intensive agriculture as shown by their Storie index ratings. The six grades and their range in index ratings are:

Grade 1—80 to 100
Grade 2—60 to 79
Grade 3—40 to 59
Grade 4—20 to 39
Grade 5—10 to 19
Grade 6—less than 10

In the area, soils in *Grade 1* soils are well suited to intensively grown irrigated crops that are climatically adapted to the region.

Grade 2 soils are good agricultural soils, although they are not so desirable as soils in grade 1 because of a less permeable subsoil, deep cemented layers (e.g., duripans), a gravelly or moderately fine textured surface layer, moderate or strong slopes, restricted drainage, low available water capacity, lower soil fertility, or a slight or moderate hazard of flooding.

Grade 3 soils are only fairly well suited to agriculture because of moderate soil depth; moderate to steep slopes; restricted permeability in the subsoil; a clayey, sandy, or gravelly surface layer; somewhat restricted drainage; acidity; low fertility; or a hazard of flooding.

Grade 4 soils are poorly suited. They are more limited in their agricultural potential than the soils in grade 3 because of restrictions, such as a shallower depth; steeper slopes; poorer drainage; a less permeable subsoil; a gravelly, sandy, or clayey surface layer; channeled or hummocky microrelief; or acidity.

Grade 5 soils are very poorly suited to agriculture and are seldom cultivated. They are more commonly used as pasture, rangeland, or woodland.

Grade 6 soils and miscellaneous areas are not suited to agriculture because of very severe or extreme limitations. They are better suited to limited uses, such as rangeland, wildlife habitat, woodland, or watershed.

Rangeland

Prepared by Curtis J. Talbot, Rangeland Management Specialist, Natural Resources Conservation Service.

Rangeland is located in the western half of the area, generally between Interstate 5 and the Santa Clara County line. It begins on the terraces adjacent to the western edge of the San Joaquin Valley and ascends to the crest of the Coast Range.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

The rangeland on the terraces is characterized by nearly level topography and the vegetative cover of annual grasses and forbs. Soils, such as Damluis, are very deep and annually produce about 3,000 pounds per acre. In order to properly capture this production as forage, grazing must occur when the soil is sufficiently dry and the vegetation is green.

Moving westward, the topography changes to rolling foothills, although the vegetative cover is still dominated by annual grasses and forbs. Very deep soils, such as the Calla-Carbona complex, have an annual production of about 2,800 pounds per acre. The lower production is due, in part, to increased runoff from the steeper slopes. Grazing these soils while they are too wet also increases runoff due to soil compaction by trampling.

Farther west, the landscape is marked by the appearance of blue oak, although annual production remains about the same. The soils, such as Gonzaga, are coarser textured and are not as deep. Erosion is a major limitation in this area. When grazing, care should be taken to leave an adequate amount of residue to protect the soil surface and insure future productivity.

On the east slopes of the Coast Range, the soils, such as Hentine, are shallow and steep. The typical vegetation pattern is thick chaparral, of which, chamise is the most common shrub. Annual production drops to about 1,000 pounds per acre. Grazing is not very practical in this area due to steep slopes, low forage production, and impenetrable stands of shrubs.

Table 10 shows, for each soil that supports rangeland vegetation suitable for grazing, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. An explanation of the column headings in table 10 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well-managed rangeland that is supporting the characteristic plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the characteristic plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. Since only major species are listed, the percentages do not necessarily total 100 percent. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the characteristic plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only, and does not imply any certain land use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat different from the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Major rangeland management practices that are needed in the area include prescribed grazing, water development, fencing, brush management, range planting, and animal trails and walkways.

Prescribed grazing is the controlled harvest of vegetation with grazing or browsing animals, managed with the intent to achieve a specified objective. By properly following a grazing prescription, the health and vigor of selected plants are improved or maintained. Other benefits of prescribed grazing include animal health, improved water quality, and decreased soil erosion. Factors to consider when designing a grazing prescription include level and distribution of utilization, season of use, type of grazing animal, type of vegetation (both beneficial and harmful), water distribution, and stocking rate.

Water developments provide clean, dependable water to selected sites for livestock and wildlife. By providing a water supply, the distribution of livestock can be controlled, and the distribution of wildlife can be influenced. Other benefits include animal health and reduced pressure on riparian areas. Factors to consider when planning a water development include type and number of animals, the terrain, season of use, soil limitations for selected sites, and cost of installation and maintenance.

Fencing is used to form a barrier to livestock, wildlife, or people. It is used to facilitate other conservation practices that treat natural resources. Factors to consider when planning a fencing project include ease of livestock management, wildlife movement needs, soil limitations for selected sites, cost of construction and maintenance, and legal considerations.

Brush management is the removal, reduction, or manipulation of shrubby plants. Brush management can be conducted by chemical, mechanical, or biological means, or by prescribed burning. By managing brush, the desired plant community can be created. Other benefits include improved forage, enhanced wildlife habitat, the removal of noxious plants, and reduction of wildfire hazards. Factors to consider when planning brush management include form of management, growth stage of the targeted shrubs, cost of implementation and follow-up, availability of alternate forage during implementation, and potential hazards to other natural resources.

Range planting is the establishment of vegetation which is adapted to the area, thus creating the desired plant community. Benefits of range planting include improved forage, browse, or cover for livestock and wildlife, and protection of other natural resources. Factors to consider when planning a range planting include nutritional or other value of selected species of vegetation, capability of soil for planting, time needed

for establishment, cost of implementation, and availability of alternative forage during establishment.

Animal trails and walkways provide access and movement for livestock or wildlife through difficult terrain. Benefits include improved grazing proficiency, better access to forage, water, and shelter, and easier handling of livestock. Factors to consider when planning a trail or walkway include cost of implementation and maintenance and potential erosion problems or damage to other natural resources.

Technical assistance in managing rangeland can be obtained from the local offices of the Natural Resources Conservation Service, the Cooperative Extension Service, and the West Stanislaus Resource Conservation District.

Vegetative Soil Groups

A vegetative soil group consists of soils that have similar properties and qualities that characterize the group in terms of plant adaptation and use. Vegetative soil groups are use primarily in determining the best-suited plants for conservation practices and forage production. The major limiting soil feature or problem that characterizes the group affects suitability. Technical assistance in using vegetative soil groups can be obtained from local offices of the Natural Resources Conservation Service and the resource conservation district.

The vegetative soil group of each component is given in the section "Detailed Soil Map Units."

The letter *A* indicates that the choice of plants is not limited by soil features. The soils are deep to very deep, moderately coarse to medium textured, moderately well to well-drained, moderately rapid to moderately slow permeability. They may be slightly wet and slightly saline or sodic.

The letter *B* indicates that the choice of plants is limited by droughtiness and low fertility. The soils are coarse to gravelly medium textured, excessively drained, and have less than five inches of available water in the root zone.

The letter *C* indicates that the choice of plants is limited by texture. The soils are deep or very deep, moderately well drained, and moderately slow or slow permeability.

The letter *D* indicates that the choice of plants is limited by a very slow permeability in a claypan subsoil. The soils are moderately well drained.

The letter *E* indicates that the choice of plants is limited by wetness. The soils are somewhat poorly to very poorly drained. Drained soil phases are assigned to the group indicated by the current status of the water table. The soils may be slightly saline, slightly sodic or both.

The letter *F* indicates that the choice of plants is limited by salinity or sodicity. The soils are moderately or strongly saline-sodic, and generally somewhat poorly or poorly drained.

The letter *G* indicates that the choice of plants is limited by depth. The soils are shallow or moderately deep over a hardpan, bedrock or other unfractured dense material and are well drained.

The letter *H* indicates the choice of plants is limited by low pH of less than 5.6. The soils are strongly to extremely acid.

The letter *I* indicates that the choice of plants is limited by toxic properties or a serious nutrient imbalance. The soils generally are moderately or strongly affected by serpentine.

The letter *J* indicates that the choice of plants depends upon onsite investigation. The components occur as nonarable miscellaneous areas, such as Dumps and Pits.

Recreation

The soils of the area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have level or nearly level slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Steep slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Fish and wildlife are valuable resources in the area. Fish and wildlife improve the quality of the environment, act as early indicators of pollution, and provide numerous opportunities for recreation. Wildlife-related activities, such as nature study, bird watching, hunting, and fishing have a positive effect on the economy of the area. Many types of wildlife help in the natural control of weed, insect, and animal pests.

Warm-water fish, such as bass, bluegill, crappie and other sunfish, catfish, and several nongame species inhabit the San Joaquin River, the California Aqueduct, and other water bodies in the area. In addition to habitat for fish and other aquatic wildlife, the river and its tributary creeks and drainageways provide corridors of riparian vegetation which is critical habitat for a wide variety of species. The river and other wetlands in the area also provide important habitat for migratory waterfowl of the Pacific Flyway. Chaparral and oak woodland areas of the Diablo Mountains are home to a portion of the Pacheco herd of Columbian black-tailed deer.

Human activities have various effects on wildlife populations. Many wildlife species, such as coyotes, opossums, and ground squirrels, can tolerate these activities and actually thrive in close association with humans. Conversely, the existence of some species has been threatened by human modification of the environment. Species that have been listed as threatened or endangered by the state and/or federal governments in the area include San Joaquin kit fox, Aleutian Canada goose, and valley elderberry longhorn beetle. Species being considered for listing include California tiger salamander, tricolored blackbird, and riparian brush rabbit. Critical habitat for these species should be preserved. Preserving habitat for threatened and endangered species can also benefit other species and perhaps reduce the need for additional future listings.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, water, and cover. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

The soils in the survey area have been assigned to three habitat-soil groups. Each group consists of soils that occupy similar landscape positions, have similar properties, and produce or have the potential to produce similar vegetation. The discussion of each group includes landscape position, soil properties, vegetative elements, habitats of special value, and management considerations.

Habitat-Soil Group 1—Wetlands and Related Habitats

This group consists of parts of general soil map units 1, 2, 3, 4, 5, 6, and 7. The soils are dominantly on flood plains, interfan basins, and low alluvial fans. The soils are nearly level, very deep, moderately coarse to fine textured, and poorly to moderately well drained. The vegetation includes grain and seed crops, domestic grasses and legumes, wild herbaceous plants, saline and nonsaline wetland plants, and riparian shrubs, trees, and vines.

Habitats of special value include riparian areas associated with waterways. This type of habitat provides food, water, and cover for a greater diversity of wildlife than any other type in the Central Valley. Riparian habitat has been reduced to less than 10 percent of the historical amount in the area by flood control and drainage projects which have allowed conversion to agriculture and homesite development. Often a narrow corridor of riparian vegetation along a streambank is the only perennial wildlife habitat remaining in agricultural areas. Wetlands associated with the river, such as sloughs, marshes, and oxbow lakes, have also been largely eliminated.

Management considerations include protecting existing riparian vegetation. Large trees and snags should be retained as perches and nesting sites for birds. Valley oaks (*Quercus lobata*) are particularly valuable for their acorns are used as a food source by many animals. Blue elderberry shrubs (*Sambucus mexicana*) should be retained for the threatened valley elderberry longhorn beetle.

Maintaining and restoring riparian and wetland habitats on these soils may be limited by the artificially lowered water table and reduction in flooding caused by the construction of drainage systems, dams, and levees. This limitation can be overcome by the application of supplemental water. Another method that has been used in neighboring counties involves strategic breaching of levees in order to restore flood water flows to the desired wildlife habitat area while still protecting cropland and homesite areas from inundation. Habitats in general soil map unit 7 are additionally limited by saline-sodic conditions. Plants used in developing wetland habitat must be saline-sodic tolerant.

Habitat-Soil Group 2—Cropland, Pasture, and Associated Habitats

This group consists of parts of general soil map units 1, 2, 3, 4, 5, 6, 7, 8, and 9. The soils are dominantly on low alluvial fans, older alluvial fans, and dissected terraces. The soils are nearly level to strongly sloping, very deep, moderately coarse to fine textured, and poorly to well drained. The vegetation includes grain and seed crops, grasses and legumes, and wild herbaceous plants.

Habitats of special value include irrigated pasture, alfalfa, and grain fields, especially rice. Waterfowl, herons, cranes, and pheasants utilize these areas for resting and/or feeding. Vineyards and orchards provide cover, nesting, and roosting sites for other birds, including dove and quail.

Management considerations for promoting wildlife in this group include providing summer water and year-round food and cover. A summer water supply is usually readily available from irrigation systems. Year-round food and cover can be supplied by establishing hedgerows along field borders, leaving grain standing in the fields over winter, planting cover crops in orchards and vineyards, and maintaining naturally occurring vegetation in adjacent uncultivated areas. Installing raptor perches and nest boxes on field borders can often control rodent problems.

Habitat-Soil Group 3—Rangelands and Related Habitats

This group consists of general soil map units 10, 11, and 12 and parts of units 8 and 9. The soils are dominantly on uplifted and dissected terraces and on mountains. The soils are moderately sloping to very steep, moderately coarse to fine textured, very deep to shallow, and well drained. The vegetation on these map units is diverse and is influenced by soil depth and parent material, slope aspect, and elevation. It ranges from wild herbaceous plants to upland shrubs and trees.

Habitats of special value include oak and pine-oak woodlands, chaparral and coastal sagebrush areas, serpentine plant communities, and riparian areas along creeks. Oaks and pines provide food and nesting, perching, and roosting sites for many wildlife species. Over 160 species of birds and 60 species of mammals (one-third of all the mammals in California) live in oak woodlands. The shrubs of the chaparral and coastal sagebrush communities provide dense cover and food for a wide variety of animals. Deer browse the leaves of these plants and bed down under their cover. Many shrubs also produce berries used by birds and other animals. The serpentine soils in general soil map unit 12 support a unique plant community found only in California's coast range. Riparian areas provide corridors of cover and water in otherwise open and arid regions.

Management considerations include the use of grazing systems that improve the amount of ground cover and promote the species most desirable to livestock and wildlife. Grazing in riparian areas should

be strictly controlled in order to maintain their characteristic plant communities and the wildlife dependent on them. Brush clearing and thinning activities should be planned to enhance the habitat by retaining the most productive food trees and patches of shrubs for cover. Oaks and pines that are past maturity, as well as their snags, should be retained at the rate of 1 to 2 per acre to provide optimum perching, nesting, and food storage sites for birds and cavity-nesting mammals. Fallen trees and branches also provide feeding, perching, and sheltering areas. The development of year-round water supplies, such as livestock troughs and guzzlers, and the careful management of water sources in springs and riparian areas greatly enhances the habitat for all wildlife.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of

digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The depth to a seasonal high water table and the susceptibility of the soil to flooding affects the time of the year that excavations can be made. Soil texture and depth to the water table affect the resistance of the excavation walls or banks to sloughing or caving.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes

up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of groundwater pollution. Ease of excavation and revegetation should be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. Large stones, a high water table, and slope affect the ease of excavation. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water

table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment

can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a groundwater aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving affect excavating and grading and the stability of ditchbanks. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The depth of the root zone, the amount of salts or sodium, and soil reaction, affects the performance of a system.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affects the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (AASHTO, 1986) and the system adopted by the American Association of State Highway and Transportation Officials (ASTM, 1993).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the

change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Water Features

Table 18 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of

occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or redoximorphic features in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table, that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Soil Features

Table 19 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

A *cemented pan* is a cemented or indurated subsurface layer within a depth of 5 feet. Such a pan causes difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 20 and the results of chemical analysis in table 21. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series. They are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by Soil Survey Laboratory, United States Department of Agriculture, Natural Resources Conservation Service, Lincoln, Nebraska.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (USDA, NRCS, 1996).

Coarse materials—(2-75 mm fraction) weight estimates of the percentages of all material less than 75 mm (3B1).
Coarse materials—(2-250 mm fraction) volume estimates of the percentages of all material greater than 2 mm (3B2).
Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).
Water retained—pressure extraction, percentage of ovendry weight of less than 2 mm material; 1/3 or 1/10 bar (4B1), 15 bars (4B2).
Water-retention difference—between 1/3 bar and 15 bars for whole soil (4C1).
Water-retention difference—between 1/10 bar and 15 bars for whole soil (4C2).
Bulk density—of less than 2 mm material, saran-coated clods field moist (4A1a), 1/3 bar (4A1d), ovendry (4A1h).
Moist bulk density—of less than 2 mm material, cores (4A3).
Moist bulk density—of less than 2 mm material, compliant cavity (4A5).
Linear extensibility—change in clod dimension based on whole soil (4D).
Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).
Organic carbon—dry combustion (6A2d).
Total nitrogen—Kjeldahl (6B3).
Extractable cations—ammonium acetate pH 7.0, atomic absorption; calcium (6N2e), magnesium (6O2d), sodium (6P2b), potassium (6Q2b).
Extractable cations—ammonium acetate pH 7.0, EDTA-alcohol separation; calcium (6N2a), magnesium (6O2a); flame photometry; sodium (6P2a), potassium (6Q2a).
Extractable acidity—barium chloride-triethanolamine IV (6H5a).
Cation-exchange capacity—ammonium acetate, pH 7.0, steam distillation (5A8b).
Cation-exchange capacity—sum of cations (5A3a).
Effective cation-exchange capacity—sum extractable cations plus aluminum (5A3b).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Reaction (pH)—1:1 water dilution (8C1f).
Reaction (pH)—saturated paste (8C1b).
Reaction (pH)—potassium chloride (8C1g).
Reaction (pH)—sodium fluoride (8C1d).
Reaction (pH)—calcium chloride (8C1f).
Aluminum—potassium chloride extraction (6G9).
Aluminum—acid oxalate extraction (6G12).
Iron—acid oxalate extraction (6C9a).
Silica—acid oxalate extraction (6V2).
Sesquioxides—dithionate-citrate extract; iron (6C2b), aluminum (6G7a), manganese (6D2a).
Soil resistivity—saturated paste (8E1).
Total soluble salts—estimate from resistivity (8A2).
Total soluble salts—estimate from conductivity (8D5).
Carbonate as calcium carbonate—(fraction less than 2 mm) manometric (6E1g).
Carbonate as calcium carbonate—(fraction less than 2 mm) manometric (6F4).
Gypsum—precipitation in acetone (6F1a).

Soluble ions—acid titration, saturated paste; carbonate (6I1b), bicarbonate (6J1b).
Soluble ions—anion chromatograph, saturated paste; chloride (6K1c), sulfate (6L1c), nitrate (6M1c).
Electrical conductivity—saturation extract (8A3a).
Sodium adsorption ratio (5E).
Extractable phosphorus—Bray P-1 (6S3).
Available phosphorus—(method of reporting laboratory).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, NRCS, 1998 and 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 22 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeralf (*Xer*, meaning dry, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxeralfs (*Haplo*, meaning minimal horizonation, plus *xeralf*, the suborder of the Alfisols that has a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haploxeralfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy-skeletal, mixed, superactive, thermic Typic Haploxeralfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, SCS, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, NRCS, 1999) and in "Keys to Soil Taxonomy" (USDA, NRCS, 1998). Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Alo Series

The Alo series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from shale. Slope ranges from 15 to 50 percent.

Taxonomic class: Fine, smectitic, thermic Aridic Haploxererts

Typical Pedon

Alo clay, in an area of Alo-Vaquero complex, 30 to 50 percent slopes

A—0 to 12 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine and fine tubular and interstitial pores; pressure faces; neutral (pH 6.6); gradual smooth boundary.

Bss—12 to 22 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; hard, firm, sticky and plastic; few very fine roots; common very fine and fine tubular and interstitial pores; common intersecting slickensides; neutral (pH 6.8); clear wavy boundary.

Bk—22 to 35 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine tubular and interstitial pores; slightly effervescent with segregations of carbonates in few fine soft masses; slightly alkaline (pH 7.4); abrupt wavy boundary.

Cr—35 inches; brown (10YR 4/3) highly weathered shale.

Typical pedon location: Stanislaus County, California; 1,300 feet north and 2,000 feet west of the southeast corner of section 19, T. 4 S., R. 6 E., 37 degrees 34 minutes 07 seconds north latitude and 121 degrees 21 minutes 35 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Depth to soft shale is 24 to 40 inches.

The A and Bss horizons are 10YR 4/2, 4/3, 5/2, 5/3 or 2.5Y 4/2 or 5/2. Moist color is 10YR 3/2 or 4/2 or 2.5Y 3/2. Reaction is slightly acid to slightly alkaline. Gravel content is 0 to 5 percent.

The Bk horizon is 10YR 4/4, 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4 or 2.5Y 5/2, 5/4, or 6/4. Moist color is 10YR 3/2, 3/3, or 4/2 or 2.5Y 4/2. Texture is clay loam, silty clay, or clay. Reaction is neutral to moderately alkaline. Gravel content is 0 to 10 percent.

Arburua Series

The Arburua series consists of moderately deep, well drained soils on mountains and foothills. These soils formed in material weathered from calcareous sandstone or shale. Slope ranges from 2 to 75 percent.

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, thermic Typic Xerorthents

Typical Pedon

Arburua loam, in an area of Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes

Ak—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine and few fine roots; common very fine tubular and interstitial pores; strongly effervescent with few fine soft masses; moderately alkaline (pH 7.9); clear smooth boundary.

Bk1—6 to 14 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine and few fine roots; common very fine tubular and interstitial pores; violently effervescent with few fine soft masses; moderately alkaline (pH 7.9); clear smooth boundary.

Bk2—14 to 22 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; few very fine and fine tubular and interstitial pores; violently effervescent with few fine filaments and many fine soft masses of lime; moderately alkaline (pH 7.9); abrupt wavy boundary.

Cr—22 to 24 inches; light gray (10YR 7/2) strongly weathered calcareous sandstone.

R—24 inches; white (10YR 8/2) calcareous sandstone.

Typical pedon location: Stanislaus County, California; about 1,500 feet south and 3,700 feet east of the northwest corner of section 12, T. 5 S., R. 6 E., 37 degrees 31 minutes 05 seconds north latitude, 121 degrees 15 minutes 16 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Depth to soft sandstone or shale is dominantly 30 to 40 inches, although it ranges from 20 to 40 inches. The soft bedrock is underlain by hard sandstone or shale. Gravel content is 0 to 15 percent.

The A horizon is 10YR 4/2, 5/2, 5/3, 5/4, or 6/3 or 2.5Y 5/2. Moist color is 10YR 4/2 or 4/3 or 2.5Y 4/2 or 4/4. Reaction is slightly alkaline or moderately alkaline.

The Bk horizon is 10YR 5/2, 5/3, 6/2, 6/3, or 7/2; 2.5Y 6/2; or 7.5YR 5/4. Moist color is 10YR 4/2, 4/3, 4/4, 5/2, or 5/3 or 2.5Y 4/2, 5/4, or 6/2. Texture is loam or clay loam.

Ayar Series

The Ayar series consists of deep, well drained soils on foothills. These soils formed in material weathered from calcareous shales and sandstone. Slope ranges from 30 to 50 percent.

Taxonomic class: Fine, smectitic, thermic Typic Haploxererts

Typical Pedon

Ayar clay, in an area of Ayar clay, 30 to 50 percent slopes

A1—0 to 5 inch; grayish brown (10YR 5/2) clay, dark brown (10YR 3/3) moist; strong coarse prismatic structure parting to moderate coarse angular blocky; hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; slightly effervescent with disseminated lime; moderately alkaline (pH 8.0); abrupt smooth boundary.

A2— 5 to 15 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5YR 3/2) moist; strong medium and coarse angular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine tubular pores; slightly effervescent with disseminated lime; moderately alkaline (pH 8.0); clear smooth boundary.

Bss—15 to 26 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to strong coarse subangular blocky; hard, firm, sticky and very plastic; common very fine roots; common very fine tubular pores; few nearly vertical slickensides; strongly effervescent with disseminated lime; moderately alkaline (pH 8.0); clear smooth boundary.

Bssk1—26 to 32 inches; yellowish brown (10YR 5/4) clay, brown (7.5YR 4/4) moist; strong coarse prismatic structure parting to moderate coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine and few fine and medium roots; common very fine tubular pores; thin continuous clay films line some tubular pores; common slickensides; strongly effervescent with lime in fine soft masses and disseminated; moderately alkaline (pH 8.0); clear smooth boundary.

Bssk2—32 to 47 inches; yellowish brown (10YR 5/4) clay, brown (7.5YR 4/3) moist; strong coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, sticky and plastic; few very fine and medium roots; common fine and very fine tubular pores; few thin continuous clay films line tubular pores; common slickensides; violently effervescent with disseminated lime and soft lime masses; moderately alkaline (pH 8.0); abrupt smooth boundary.

Cr—47 to 60 inches; reddish yellow (7.5YR 6/6) and pink (7.5YR 7/4) shale and sandstone, strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) moist; firm or hard in place; thin seams of lime in joints.

Typical pedon location: Stanislaus County, California; 1800 feet south and 1500 feet east of the northwest corner of section 7, T. 5 S., R. 7 E., 37 degrees 31 minutes 02 seconds north latitude, 121 degrees 14 minutes 37 seconds west longtitude, Westley 7.5 minute quadrangle.

Range in Characteristics

Depth to shale or sandstone ranges from 40 to 60 inches. Deep, wide cracks in the soils remain open from June to November for 150 to 180 days and remain closed the rest of the year.

The A horizon is 7.5YR 5/2, 5/4, 4/2, or 4/4; 10YR 6/4, 5/4, 5/3, 4/3, 3/3, 5/2, or 4/2; or 2.5Y 5/2, 4/2. Moist color is similar with value 1 or 2 units lower.

The Bss and Bssk horizons are 2.5Y 6/4, 5/4, or 5/2; 10YR 6/4, 6/3, 5/4, 5/3, or 4/8; or 7.5YR 5/2, 5/4, 6/4, or 7/4.

Bolfar Series

The Bolfar series consists of very deep, poorly drained soils on flood plains. These soils formed in alluvium, dominantly from granitic rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, thermic Cumulic Endoaquolls

Typical Pedon

Bolfar loam, in an area of Bolfar-Columbia complex, partially drained, 0 to 2 percent slopes, rarely flooded

Ap—0 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; few very fine tubular and interstitial pores; moderately alkaline (pH 7.9); clear wavy boundary.

Ak1—9 to 16 inches; dark grayish brown (2.5Y 4/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure;

hard, friable, sticky and plastic; few fine and medium roots; common fine tubular pores; few fine faint dark brown (10YR 3/3) iron accumulations moist; strongly effervescent with disseminated carbonates and segregations of carbonates in seams; moderately alkaline (pH 8.0); clear wavy boundary.

Ak2—16 to 24 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine and medium roots; common fine tubular pores; few fine distinct brown (10YR 4/3) iron accumulations moist; strongly effervescent with segregations of carbonates in seams; moderately alkaline (pH 8.2); clear smooth boundary.

Btk1—24 to 31 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; common very fine tubular pores; few thin clay films bridging sand grains and lining tubular pores; few fine distinct dark yellowish brown (10YR 4/4) iron accumulations moist; strongly effervescent with segregations of carbonates in common fine seams and soft masses; moderately alkaline (pH 8.4); abrupt smooth boundary.

Btk2—31 to 38 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; common fine tubular pores; few thin clay films bridging sand grains and lining tubular pores; few fine distinct yellowish brown (10YR 5/4) iron accumulations moist; strongly effervescent with disseminated carbonates and segregations of carbonates in common fine seams and few fine concretions; moderately alkaline (pH 8.4); abrupt smooth boundary.

C1—38 to 44 inches; pale brown (10YR 6/3) stratified sandy loam and loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; few fine distinct dark brown (7.5YR 4/4) iron accumulations moist; strongly effervescent with disseminated carbonates; moderately alkaline (pH 8.2); clear smooth boundary.

C2—44 to 60 inches; pale brown (10YR 6/3) stratified sandy loam and loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine tubular pores and few fine interstitial pores; few fine distinct dark brown (10YR 4/3) and brown (7.5YR 4/4) iron accumulations moist; strongly effervescent with disseminated carbonates; moderately alkaline (pH 8.4).

Typical pedon location: Stanislaus County, California; 4,200 feet south and 4,950 feet west of the northeast corner of section 14, T. 4 S., R. 7 E., 37 degrees 34 minutes 59 seconds north latitude, 121 degrees 10 minutes 27 seconds west longtitude, Westley 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 3/1, 4/1, or 5/2 or 2.5Y 3/2, 4/2, or 5/2. Moist color is 10YR 3/1 or 3/2 or 2.5Y 3/2. Texture is loam or clay loam. Reaction is slightly alkaline or moderately alkaline. Redoximorphic features are distinct or prominent in the lower part of the horizon.

The Btk horizon is 10YR 5/2 or 6/3 or 2.5Y 5/2 or 6/2. Moist color is 10YR 3/3, 4/2, or 5/3 or 2.5Y 3/2, 4/2 or 5/2. Redoximorphic features are distinct or prominent. Texture is loam, clay loam, or sandy clay loam.

The C horizon is 10YR 6/3 or 2.5Y 4/2 or 6/2. Moist color is 10YR 4/2, 4/3, or 4/4 or 2.5Y 3/2, 4/2, 4/4, or 5/2. Texture is stratified sandy loam, loam, or clay loam.

Calla Series

The Calla series consists of very deep, well drained soils formed in calcareous alluvium from sedimentary rock sources. Calla soils are on dissected and uplifted terraces. Slope ranges from 30 to 50 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Calcic Haploxerepts

Typical Pedon

Calla clay loam, in an area of Calla-Carbona complex, 30 to 50 percent slopes

A—0 to 11 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; 5 percent gravel; strongly effervescent with disseminated carbonates and few fine irregular soft masses of carbonates; moderately alkaline (pH 8.0); clear smooth boundary.

Bk1—11 to 21 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; 5 percent

gravel; violently effervescent with disseminated carbonates and common fine irregular soft masses of carbonates; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2—21 to 30 inches; brownish (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; 5 percent gravel; violently effervescent with disseminated carbonates and many fine and few medium irregular soft masses of carbonates; moderately alkaline (pH 8.2); clear wavy boundary.

Bk3—30 to 43 inches; brownish (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine tubular pores; 5 percent gravel; violently effervescent with disseminated carbonates and common fine and few medium irregular soft masses of carbonates; moderately alkaline (pH 8.2); clear smooth boundary.

Bk4—43 to 52 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine tubular pores; 5 percent gravel; violently effervescent with disseminated carbonates and common fine irregular soft masses of carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

Bk5—52 to 60 inches; very pale brown (10YR 7/3) clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; soft, very friable, sticky and plastic; few very fine tubular pores; 5 percent gravel; violently effervescent with disseminated carbonates and many fine and common medium irregular soft masses of carbonates; moderately alkaline (pH 8.4).

Typical pedon location: Stanislaus County, California; 1800 feet south and 1500 feet east of the northwest corner of section 7, T. 5 S., R. 7 E., 37 degrees 31 minutes 02 seconds north latitude, 121 degrees 14 minutes 37 seconds west longtitude, Westley 7.5 minute quadrangle.

Range in Characteristics

Content of gravel is 0 to 10 percent. Reaction is slightly alkaline or moderately alkaline throughout.

The A horizon is 10YR 6/1, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. Moist color is 10YR 4/2 or 4/3 or 2.5Y 4/2 or 5/2.

The Bk horizon is 10YR 5/2, 5/3, 6/2, 6/3, 6/4, 7/3, or 8/2 or 2.5Y 6/2. Moist color is 10YR 4/2, 4/3, or 5/4. Calcium carbonate equivalent is 15 to 25 percent in some part and decreases to 5 to 10 percent below.

Capay Series

The Capay series consists of very deep, moderately well drained soils on interfan basins. These soils formed in alluvium from mixed rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, smectitic, thermic Typic Haploxererts

Typical Pedon

Capay clay, 0 to 2 percent slopes

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong coarse subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine and few fine roots; common very fine tubular pores; neutral (pH 7.3); clear smooth boundary.

A—11 to 20 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong coarse subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; few pressure faces; slightly alkaline (pH 7.4); gradual smooth boundary.

Bss1—20 to 30 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse angular blocky structure; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine tubular pores; few intersecting slickensides; slightly alkaline (pH 7.6); gradual smooth boundary.

Bss2—30 to 39 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse angular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; many intersecting slickensides; slightly alkaline (pH 7.6); clear smooth boundary.

Bk1—39 to 51 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; weak coarse angular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; few pressure faces; slightly effervescent with segregations of carbonates in few fine soft masses; slightly alkaline (pH 7.6); clear smooth boundary.

Bk2—51 to 60 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; weak coarse angular blocky structure; very hard, firm, very sticky and very

plastic; few pressure faces; strongly effervescent with segregations of carbonates in common fine soft masses; slightly alkaline (pH 7.6).

Typical pedon location: Stanislaus County, California; 2,400 feet north and 2,400 feet west of the southeast corner of section 15, T. 4 S., R. 6 E., 37 degrees 35 minutes 13 seconds north latitude, 121 degrees 17 minutes 42 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Reaction is neutral or slightly alkaline. Disseminated and segregated carbonates occur at a depth of 20 or more inches.

The A horizon is 10YR 4/2, 4/3, 5/2, or 5/3 or 2.5Y 4/2 or 5/2. Moist color is 10YR 3/2, 3/3, 4/2, or 4/3 or 2.5Y 3/2 or 4/2. Texture is clay or clay loam.

The Bk and Bss horizons are 10YR 4/2, 4/3, 5/2, 5/3, 5/4, 6/3, 6/4, or 7/2 or 2.5Y 4/4 or 5/4. Moist color is 10YR 3/2, 3/3, 4/2, 4/3, 4/4, 4/6, or 6/3 or 2.5Y 4/2, 4/4, or 5/6. Texture is clay, silty clay, silty clay loam, or clay loam.

Carbona Series

The Carbona series consists of very deep, well drained soils on uplifted dissected terraces. These soils formed in alluvium from mixed rock sources. Slope ranges from 2 to 50 percent.

Taxonomic class: Fine, smectitic, thermic Vertic Haploxerolls

Typical Pedon

Carbona clay loam, 2 to 8 percent slopes

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; common very fine tubular and interstitial pores; 6 percent gravel; slightly alkaline (pH 7.6); clear smooth boundary.

A1—9 to 15 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure, hard, firm, sticky and plastic; common very fine roots and few medium roots; many very fine tubular pores; 3 percent gravel; slightly alkaline (pH 7.8); gradual smooth boundary.

A2—15 to 24 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; few very fine tubular pores; 3 percent gravel; slightly alkaline (pH 7.8); clear smooth boundary.

Bk1—24 to 36 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; few very fine tubular pores; strongly effervescent with segregations of carbonates in common fine, soft masses and seams; 3 percent gravel; moderately alkaline (pH 8.2); clear wavy boundary.

Bk2—36 to 50 inches; yellowish brown (10YR 5/4) clay, brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; violently effervescent with segregations of carbonates in many fine, soft masses and seams; 3 percent gravel; moderately alkaline (pH 8.2); gradual wavy boundary.

Bk3—50 to 60 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, sticky and plastic; few very fine tubular pores; strongly effervescent with segregations of carbonates in common fine, soft masses and seams; 3 percent gravel; moderately alkaline (pH 8.4).

Typical pedon location: Stanislaus County, California; 2,000 feet south and 2900 feet west of the northwest corner of section 1, T. 5 S., R. 6 E., 37 degrees 32 minutes 30 seconds north latitude, 121 degrees 15 minutes 09 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Content of gravel is 0 to 15 percent.

The A horizon is 7.5YR 5/2 or 10YR 4/1, 4/2, 5/1, 5/2, or 5/3. Moist color is 7.5YR 3/2 or 10YR 3/1, 3/2, or 3/3. Texture is clay loam or clay. Reaction is slightly alkaline or moderately alkaline.

The Bk horizon is 10YR 5/3, 5/4, 6/3, 6/4, or 7/4. Moist color is 10YR 4/3, 4/4, 5/3, or 5/4. Texture is clay loam or clay.

Carranza Series

The Carranza series consists of very deep, well drained soils. This soils formed in alluvium dominantly from sedimentary rock. Carranza soils are in alluvial fans and have slopes of 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Pachic Haploxerolls

Typical Pedon

Carranza gravelly clay loam, in an area of Carranza-Woo complex, 0 to 2 percent slopes

A—0 to 10 inches; brown (7.5YR 4/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine roots; common very fine tubular pores; 25 percent gravel; neutral; clear smooth boundary.

Bt—10 to 38 inches; brown (7.5YR 4/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine roots; common very fine and few fine tubular pores; few thin clay films on peds and line pores; 20 percent gravel; neutral (pH 7.0); clear wavy boundary.

C—38 to 60 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine and fine tubular pores; thin lenses of extremely gravelly loamy sand 1/4 to 1/2 inch thick; 75 percent gravel; neutral (pH 7.2).

Typical pedon location: Stanislaus County, California; 750 feet south and 2,400 feet east of the northwest corner of section 25, T. 6 S., R. 7 E., 37 degrees 23 minutes 27 seconds north latitude, 121 degrees 09 minutes 04 seconds west longtitude, Patterson 7.5 minute quadrangle.

Range in Characteristics

The upper boundary of the extremely gravelly layer is at a depth of 35 to 50 inches. Reaction is neutral in the upper part of the soils to slightly alkaline in the lower part.

The A horizon is 10YR 4/2 or 5/3 or 7.5YR 4/2. Moist color is 10YR 3/2 or 3/3 or 7.5YR 3/2. Gravel content ranges from 15 to 25 percent.

The Bt horizon is 10YR 4/2, 4/4, 5/2, or 5/4 or 7.5YR 4/2, 4/4, 5/2, or 5/4. Moist color is 10YR 3/2 or 3/3 or 7.5YR 3/2. Texture is gravelly clay loam to gravelly sandy clay loam with 15 to 25 percent gravel.

The C horizon is stratified extremely gravelly loamy sand to extremely gravelly sandy loam 60 to 75 percent gravel.

Chaqua Series

The Chaqua series consists of deep, well drained soils on terraces. These soils formed in calcareous alluvium from sedimentary rock sources. Slope ranges from 2 to 15 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Calcic Haploxerepts

Typical Pedon

Chaqua loam, in an area of Chaqua-Arburua complex, 5 to 8 percent slopes

Ak1—0 to 9 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine and fine tubular pores; 5 percent gravel, 2 to 15 mm in size; strongly effervescent with disseminated carbonates and segregations of carbonates in few fine soft masses; slightly alkaline (pH 7.6); clear smooth boundary.

Ak2—9 to 18 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine tubular pores; 5 percent gravel, 2 to 15 mm in size; strongly effervescent with disseminated carbonates and segregations of carbonates in few fine soft masses; moderately alkaline (pH 8.0); clear smooth boundary.

Btk—18 to 41 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; many thin clay films on ped faces and in pores; 5 percent gravel, 2 to 15 mm in size; violently effervescent with disseminated carbonates and segregations of carbonates in common fine and medium seams; moderately alkaline (pH 8.2); abrupt wavy boundary.

2Cr—41 inches; brown (7.5YR 5/4) and white (10YR 8/1) strongly weathered calcareous sandstone.

Typical pedon location: Stanislaus County, California; 100 feet north and 1,500 feet west of the southeast corner of section 20, T. 4 S, R. 6 E., 37 degrees 33 minutes 57 seconds north latitude, 121 degrees 19 minutes 42 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Depth to soft sandstone ranges from 40 to 60 inches.

The Ak horizon is 10YR 4/4, 5/2, 5/3, 5/4, or 6/2 or 7.5YR 5/4. Moist color is 10YR 4/2 or 4/3 or 7.5YR 3/4. Clay content ranges from 22 to 27 percent. Calcium carbonate equivalent ranges from 5 to 15 percent.

The Btk horizon is 10YR 6/2 or 6/3 or 7.5YR 4/4, 5/4, or 6/4. Moist color is 10YR 4/2, 4/3, or 6/2 or

7.5YR 3/4 or 5/4. Texture is loam, clay loam, or sandy clay loam.

Clear Lake Series

Clear Lake series consists of very deep, poorly drained under natural conditions and are now artificially drained soils in basins. These soils formed in alluvium from mixed rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, smectitic, thermic Xeric Endoaquerts

Typical Pedon

Clear Lake clay,partially drained, 0 to 2 percent slopes, rarely flooded

Ap—0 to 7 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; strong medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; many very fine and few fine roots; many very fine and fine tubular pores; neutral (pH 6.9); clear wavy boundary.

Bss1—7 to 16 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; massive; extremely hard, very firm, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; few fine black (10YR 2/1) manganese concretions; many intersecting slickensides; neutral (pH 7.0); gradual wavy boundary.

Bss2—16 to 28 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; massive; extremely hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; few fine black (10YR 2/1) manganese concretions; many intersecting slickensides; neutral (pH 7.1); diffuse smooth boundary.

Bss3—28 to 48 inches; dark gray (10YR 4/1) clay; black (10YR 2/1) moist; massive; very hard, very firm, very sticky and very plastic; few very fine and few medium roots; many intersecting slickensides; neutral (pH 7.2); gradual wavy boundary.

Bssk—48 to 60 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; massive; very hard, very firm, very sticky and very plastic; many intersecting slickensides; strongly effervescent with disseminated carbonates and segregations of carbonates as few fine soft masses; slightly alkaline (pH 7.4).

Typical pedon location: Stanislaus County, California; 37 degrees 36 minutes 07 seconds north latitude, 121 degrees 12 minutes 28 seconds west longtitude (in an unsectionized area), Westley 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 3/1, 4/1, or 5/1. Moist color is 10YR 2/1 or 3/1.

The Bss and Bssk horizons are 10YR 3/1, 4/1, 5/1, 5/2, or 6/2. Moist color is 10YR 3/1, 4/1, 4/2, or 5/2. Reaction is slightly alkaline in the upper part and slightly alkaline or moderately alkaline in the lower part. Texture is clay or silty clay. Carbonates are segregated in soft masses and seams in the lower part.

Columbia Series

The Columbia series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in alluvium from mixed sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, nonacid, thermic Oxyaquic Xerofluvents

Typical Pedon

Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, rarely flooded

Ap1—0 to 6 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; few very fine interstitial and tubular pores; few fine distinct yellowish brown (10YR 5/4) masses of iron accumulations, moist; neutral (pH 7.3); clear smooth boundary.

Ap2—6 to 14 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, nonsticky and slightly plastic; common very fine and fine roots; few very fine interstitial and tubular pores; few fine distinct brown (10YR 4/3) masses of iron accumulations, moist; slightly alkaline (pH 7.4); clear wavy boundary.

C1—14 to 23 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine and fine roots; common very fine tubular and few fine interstitial pores; many fine distinct yellowish brown (10YR 5/4) masses of iron accumulations, moist; slightly alkaline (pH 7.6); gradual smooth boundary.

C2—23 to 41 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and medium roots; common very fine tubular and few very fine interstitial pores; few fine faint yellowish brown (10YR 5/3) masses of iron

accumulations, moist; slightly alkaline (pH 7.6); clear smooth boundary.

C3—41 to 60 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common very fine tubular pores; few fine faint yellowish brown (10YR 5/4) masses of iron accumulations, moist; slightly alkaline (pH 7.6).

Typical pedon location: Stanislaus County, California; 37 degrees 38 minutes 46 seconds north latitude, 121 degrees 13 minutes 40 seconds west longtitude (in an unsectionized area), Ripon 7.5 minute quadrangle.

Range in Characteristics

Content of gravel is 0 to 5 percent.

The A horizon is 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4. Moist color is 10YR 4/2, 4/3, 4/4, or 5/4. Reaction is slightly acid to slightly alkaline.

The C horizon is 10YR 5/3, 5/4, 6/1, 6/2, 6/3, 6/4, 7/1, 7/2, 7/3, or 7/4. Moist color is 10YR 3/3, 4/1, 4/2, 4/3, 4/4, 5/2, 5/3, or 5/4. Iron accumulations are distinct or prominent. Texture is stratified sand to fine sandy loam. Reaction is slightly acid to slightly alkaline.

Contra Costa Series

The Contra Costa series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from shale and sandstone. Slope ranges from 30 to 75 percent.

Taxonomic class: Fine, mixed, superactive, thermic Mollic Haploxeralfs

Typical Pedon

Contra Costa clay loam, in an area of Arburua-Contra Costa-Wisflat complex, 50 to 75 percent slopes

A—0 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine and few medium roots; few very fine tubular pores; 6 percent gravel; slightly acid (pH 6.2); clear smooth boundary.

Bt1—9 to 18 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and medium roots; few very fine tubular pores; few thin clay films on ped faces and lining pores; 5 percent gravel; slightly acid (pH 6.4); clear smooth boundary.

Bt2—18 to 28 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few medium roots; few very fine tubular pores; common thick clay films on ped faces and lining pores; 5 percent gravel; slightly acid (pH 6.4); gradual smooth boundary.

Bt1—28 to 38 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few medium roots; common thick clay films on ped faces and lining pores; 5 percent angular fragments of shale; slightly acid (pH 6.4); abrupt wavy boundary.

R—38 inches; light yellowish brown (10YR 6/4) sandstone.

Typical pedon location: Stanislaus County, California; 1,800 feet north and 200 feet west of the southeast corner of section 3, T. 6 S., R. 6 E., 37 degrees 26 minutes 24 seconds north latitude, 121 degrees 17 minutes 46 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Depth to hard sandstone or shale ranges from 20 to 40 inches. Content of gravel is 0 to 10 percent.

The A horizon is 10YR 6/3, 6/2, 5/3, or 5/2. Moist color is 7.5YR 3/4 or 10YR 3/4 or 3/3. Texture is clay loam or loam. Reaction is moderately acid to neutral.

The Bt horizon is 7.5YR 6/4 or 5/4. Moist color is 7.5YR 5/4 or 4/4. Texture is clay loam or clay. Reaction is moderately acid to neutral.

Cortina Series

The Cortina series consists of very deep, somewhat excessively drained soils on alluvial fans. These soils formed in alluvium from mixed rock sources. Slope ranges from 0 to 5 percent.

Taxonomic class: Loamy-skeletal, mixed, superactive, nonacid, thermic Typic Xerofluvents

Typical Pedon

Cortina gravelly sandy loam, 0 to 2 percent slopes

Ap—0 to 6 inches; light brownish gray (10YR 6/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular and interstitial pores; 25 percent gravel; slightly alkaline (pH 7.6); gradual wavy boundary.

C1—6 to 14 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, dark grayish brown

(10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine tubular pores and common very fine interstitial pores; 40 percent gravel; slightly alkaline (pH 7.4); abrupt smooth boundary.

C2—14 to 25 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine tubular and interstitial pores; 50 percent gravel; neutral (pH 7.2); abrupt smooth boundary.

C3—25 to 33 inches; light brownish gray (10YR 6/2) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores and common fine interstitial pores; 50 percent gravel; slightly alkaline (pH 7.4); abrupt smooth boundary.

C4—33 to 38 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine tubular pores and common fine interstitial pores; 40 percent gravel; neutral (pH 7.2); abrupt smooth boundary.

C5—38 to 60 inches; pale brown (10YR 6/3) very gravelly loamy sand, brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; many very fine tubular pores and many fine interstitial pores; 50 percent gravel; neutral (pH 7.0).

Typical pedon location: Stanislaus County, California; 3,200 feet south and 2,600 feet west of the northeast corner of section 9, T. 4 S., R. 6 E., 37 degrees 36 minutes 05 seconds north latitude, 121 degrees 18 minutes 45 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Reaction is neutral or slightly alkaline.

The A horizon is 10YR 6/2 or 6/3. Moist color is 10YR 3/2 or 3/3. Content of gravel is 15 to 35 percent.

The stratified C horizon is 10YR 5/2, 5/3, 5/4, 6/2, 6/3, 6/4, or 7/3. Moist color is 10YR 4/2, 4/3, 4/4, 5/3, 5/4, 6/2, or 6/3. Texture is very gravelly sandy loam to very gravelly sand with a gravel content of 35 to 50 percent.

Damluis Series

The Damluis series consists of very deep, well drained soils on low or uplifted dissected terraces. These soils formed in alluvium from mixed rock sources. Slope ranges from 0 to 15 percent.

Taxonomic class: Fine, smectitic, thermic, Calcic Pachic Argixerolls

Typical Pedon

Damluis gravelly clay loam, 2 to 8 percent slopes

A—0 to 9 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; hard, firm, sticky and slightly plastic; many very fine roots; many very fine tubular pores; few thin pressure faces; slightly alkaline (pH 7.8); clear smooth boundary.

Bt—9 to 20 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; few thin clay films on ped faces; slightly alkaline (pH 7.8); clear smooth boundary.

Btk1—20 to 34 inches; dark grayish brown (10YR 4/2) gravelly clay, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine tubular pores; common moderately thick clay films on ped faces and lining pores; violently effervescent with carbonates segregated as few fine soft masses; moderately alkaline (pH 8.3); clear smooth boundary.

Btk2—34 to 48 inches; brown (7.5YR 5/4) gravelly clay, brown (7.5YR 4/4) moist; strong medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine tubular pores; common moderately thick clay films on ped faces and lining pores; violently effervescent with carbonates segregated as few medium soft masses; moderately alkaline (pH 8.4); clear wavy boundary.

Btk3—48 to 58 inches; brown (7.5YR 5/4) gravelly clay loam, brown (7.5YR 4/4) moist; weak medium angular blocky structure; hard, firm, sticky and plastic; few very fine tubular pores; few thin clay films on ped faces; strongly effervescent with carbonates segregated as few medium soft masses; moderately alkaline (pH 8.4); clear wavy boundary.

2Ck—58 to 60 inches; strong brown (7.5YR 5/6) very gravelly sandy clay loam, brown (10YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine interstitial pores; violently effervescent with carbonates segregated as common medium soft masses; moderately alkaline (pH 8.4).

Typical pedon location: Stanislaus County, California; 750 feet south and 2,400 feet east of the northwest corner of section 25, T. 6 S., R. 7 E., 37 degrees 23 minutes 27 seconds north latitude, 121 degrees 09 minutes 04 seconds west longtitude, Patterson 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 4/2, 4/3, 5/2, or 5/3 or 7.5YR 4/2, 4/4, or 5/2. Moist color is 10YR 3/2 or 3/3 or 7.5YR 3/2. Texture is clay loam or gravelly clay loam. This horizon is noncalcareous to slightly effervescent. Reaction is slightly alkaline or moderately alkaline.

The Bt and Btk horizons are 10YR 4/2, 4/3, 5/2, 5/3, or 5/4; 7.5YR 4/4, 4/6, 5/4, 5/6, or 6/6; or 5YR 5/3, 5/4, or 5/6. Moist color is 10YR 3/2, 4/2, 4/3, or 4/4; 7.5YR 3/4, 4/4, 4/6, 5/4, 5/6; or 5YR 3/4, 4/4, or 4/6. Texture is clay, sandy clay, gravelly clay loam, gravelly clay, or gravelly sandy clay. Reaction is slightly alkaline or moderately alkaline.

The 2Ck horizon is 10YR, 6/8, 7/2, or 7/6 or 7.5YR 5/6, 6/4, 6/6, 6/8, 7/6, or 7/8. Moist color is 10YR 4/4, 5/8, 6/4, 6/6, or 7/4 or 7.5YR 4/4, 5/6, 5/8, 6/6, or 6/8. Texture is very gravelly sandy loam or very gravelly sandy clay loam.

Deldota Series

The Deldota series consists of very deep, somewhat poorly drained soils on low alluvial fans. These soils formed in alluvium from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, smectitic, thermic Vertic Haploxerolls

Typical Pedon

Deldota clay, partially drained, 0 to 2 percent slopes

Ap1—0 to 5 inches; brown (10YR 5/3) clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and very plastic; many very fine roots; few very fine and fine tubular pores; many pressure faces; few fine very dark gray (10YR 3/1) manganese stains; slightly alkaline (pH 7.6); abrupt smooth boundary.

Ap2—5 to 12 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and very plastic; common very fine roots and few medium roots; few very fine and fine tubular pores; many pressure faces; slightly alkaline (pH 7.8); clear smooth boundary.

A—12 to 18 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate very coarse prismatic structure; very hard, firm, sticky and very plastic; common very fine roots; few very fine tubular pores; many pressure faces; moderately alkaline (pH 8.0); clear smooth boundary.

Bw—18 to 23 inches; yellowish brown (10YR 5/4) clay, brown (10YR 4/3) moist; weak coarse prismatic structure; hard, friable, very sticky and very plastic; few very fine roots; few very fine tubular pores; many pressure faces; moderately alkaline (pH 8.0); clear wavy boundary.

Bk2—23 to 32 inches; light yellowish brown (2.5Y 6/4) clay, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; many pressure faces; strongly effervescent with segregations of carbonates in few fine soft masses; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2—32 to 39 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; many pressure faces; violently effervescent with segregations of carbonates in common fine soft masses; moderately alkaline (pH 8.4); clear smooth boundary.

Bk3—39 to 49 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; common pressure faces; violently effervescent with segregations of carbonates in common medium soft masses; moderately alkaline (pH 8.4); diffuse wavy boundary.

Bk4—49 to 60 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) and dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; hard, friable, very sticky and plastic; few very fine roots; common very fine tubular pores; violently effervescent with segregations of carbonates in common medium soft masses; few fine black (10YR 2/1) manganese stains; moderately alkaline (pH 8.4).

Typical pedon location: Stanislaus County, California; 1,000 feet north and 1,100 feet west of the southeast corner of section 25, T. 7 S., R. 8 E., 37 degrees 17 minutes 32 seconds north latitude, 121 degrees 02 minutes 08 seconds west longtitude, Newman 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 4/2, 5/2, or 5/3 or 2.5Y 5/2. Moist color is 10YR 3/2 or 3/3 or 2.5Y 3/2.

The Bw horizon is 10YR 5/4 or 5/6. Moist color is 10YR 4/3 or 4/4. Texture is clay loam or clay. This horizon is slightly alkaline or moderately alkaline and is noneffervescent to strongly effervescent.

The Bk horizon is 10YR 4/3, 4/4, 5/4, or 6/4 or 2.5Y 4/4 or 6/4. Moist color is 10YR 3/3, 4/3, 4/4, or 5/4 or 2.5Y 4/4. Texture is clay loam or clay. This horizon is slightly alkaline or moderately alkaline and is strongly or violently effervescent.

Dello Series

The Dello series consists of very deep, very poorly drained soils on flood plains and old sloughs. These soils formed in alluvium from granitic rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Mixed, thermic Typic Psammaquents

Typical Pedon

Dello fine sandy loam, channeled, 0 to 2 percent slopes, frequently flooded

A—0 to 10 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; few fine and very fine roots; few very fine and fine interstitial pores; neutral (pH 7.3); abrupt wavy boundary.

Cg1—10 to 19 inches; light brownish gray (10YR 6/2) sand, grayish brown (2.5YR 5/2) moist; massive; loose, nonsticky and nonplastic; few medium roots; few very fine interstitial pores; few fine and medium distinct yellowish brown (10YR 5/4) iron accumulations moist; neutral (pH 7.3); clear smooth boundary.

Cg2—19 to 34 inches; light gray (10YR 7/1) sand, grayish brown (2.5Y 5/2) moist; massive; loose, nonsticky and nonplastic; few very fine interstitial pores; common fine and medium distinct dark yellowish brown (10YR 4/4) iron accumulations moist; neutral (pH 7.1); clear smooth boundary.

Cg3—34 to 49 inches; light brownish gray (10YR 6/2) sand, grayish brown (2.5Y 5/2) moist; massive; loose, nonsticky and nonplastic; few very fine interstitial pores; common fine and medium distinct dark yellowish brown (10YR 4/4) iron accumulations moist; neutral (pH 7.1); gradual smooth boundary.

Cg4—49 to 60 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (2.5Y 4/2) moist; massive; loose, nonsticky and nonplastic; few very fine interstitial pores; common fine distinct strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4) iron accumulations moist; slightly alkaline (pH 7.4).

Typical pedon location: Stanislaus County, California; 37 degrees 36 minutes 33 seconds north latitude, 121 degrees 11 minutes 32 seconds west longtitude (in an unsectionized area), Westley 7.5 minute quadrangle.

Range in Characteristics

Reaction is neutral to moderately alkaline. Content of gravel is 0 to 5 percent.

The A horizon is 10YR 4/2, 4/3, 4/4, 5/2, 5/3, 6/2, 6/3, or 6/4; 2.5Y 4/2, 5/2, or 6/2; or 5Y 5/2. Moist color is 10YR 3/3, 4/2, 4/3,or 4/4; 2.5Y 4/2; or 5Y 4/2. Redoximorphic features are distinct or prominent.

The Cg horizon is 10YR 5/3, 6/2, 6/3, 6/4, 6/6, 7/1, 7/2, 7/3, 8/2, or 8/3; 2.5Y 6/2, 7/2, or 8/2; or 5Y 6/1. Moist color is 10YR 4/3, 5/2, 5/4, 6/2, 6/3, 6/4, or 7/2 or 2.5Y 4/2, 5/2, 6/2, or 7/2. Texture is stratified loamy fine sand to sand. Redoximorphic features are distinct or prominent.

Dosamigos Series

The Dosamigos series consists of very deep, somewhat poorly drained soils on low alluvial fans. These soils formed in alluvium from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, smectitic, thermic Aquic Haploxerolls

Typical Pedon

Dosamigos clay loam, 0 to 2 percent slopes

Ap1—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and medium roots; common very fine and fine tubular pores; many pressure faces; few fine very dark gray (10YR 3/1) manganese stains; few fine distinct brown (7.5YR 4/4) iron accumulations moist; moderately alkaline (pH 7.9); clear smooth boundary.

Ap2—6 to 15 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine and fine tubular pores; few pressure faces; few fine very dark gray (10YR 3/1) manganese stains; few fine distinct brown (7.5YR

4/4) and dark brown (7.5YR 4/2) iron accumulations moist; moderately alkaline (pH 8.0); clear smooth boundary.

Bw1—15 to 22 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; few pressure faces; few fine very dark gray (10YR 3/1) manganese stains; few fine distinct brown (7.5YR 4/4) and common fine distinct dark brown (7.5YR 4/2) iron accumulations moist; moderately alkaline (pH 8.0); clear smooth boundary.

Bw2—22 to 29 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; few pressure faces; few fine very dark gray (10YR 3/1) manganese stains; few medium distinct brown (7.5YR 4/4) iron accumulations moist; moderately alkaline (pH 8.0); clear wavy boundary.

Bkn—29 to 42 inches; brown (10YR 5/3) clay, dark yellowish brown (10YR 4/4) and brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine tubular pores; few pressure faces; strongly effervescent with segregations of carbonates in few fine soft masses; few fine very dark gray (10YR 3/1) manganese stains; few fine distinct brown (7.5YR 4/4) iron accumulations moist; moderately alkaline (pH 8.2); gradual smooth boundary.

2Ck—42 to 60 inches; pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, sticky and plastic; few very fine tubular pores; many pressure faces; strongly effervescent with segregations of carbonates in common fine soft masses; few fine very dark gray (10YR 3/1) manganese stains; few fine distinct brown (7.5YR 4/4) iron accumulations moist; moderately alkaline (pH 8.4).

Typical pedon location: Stanislaus County, California; 2,450 feet north and 1,150 feet east of the southwest corner of section 30, T. 7 S., R. 9 E., 37 degrees 17 minutes 45 seconds north latitude, 121 degrees 01 minutes 35 seconds west longtitude, Newman 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 4/2, 5/2, 5/3, or 5/4. Moist color is 10YR 3/2 or 3/3 or 2.5Y 2/2 or 3/2.

The Bw horizon is 10YR 5/3, 5/4, 5/6, 6/2, 6/3, 6/4, 6/6, 7/4, or 7/6 or 2.5Y 6/2 or 6/4. Moist color is 10YR 3/4, 4/1, 4/3, 4/4, 4/6, 5/4, 5/6, or 6/6 or 2.5Y 4/4. Texture is clay loam or clay.

The Bn or Bkn horizon is 10YR 5/3, 5/4, 5/6, 6/3, 6/4, 6/6, 7/3, 7/6, 8/2, or 8/6 or 2.5Y 6/4, 7/6, or 8/4. Moist color is 10YR 4/2, 4/3, 4/4, 4/6, 5/3, 5/4, 5/6, 6/4, 6/6, 7/2, or 7/6 or 2.5Y 5/4, 6/6, or 7/4. Texture is clay loam or clay.

The 2Ck horizon is clay loam, clay, or sandy clay.

Dospalos Series

The Dospalos series consists of very deep, poorly drained soils on flood plains. These soils formed in alluvium dominantly from granitic rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, smectitic, calcareous, thermic Vertic Endoaquolls

Typical Pedon

Dospalos clay loam, in an area of Dospalos-Bolfar complex, partially drained, 0 to 2 percent slopes, rarely flooded

Ap—0 to 11 inches; olive gray (5Y 5/2) clay loam, dark olive gray (5Y 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and few fine roots, few medium and coarse roots; few very fine and fine tubular pores; few fine black (10YR 2/1) manganese concretions; slightly effervescent with disseminated carbonates; slightly alkaline (pH 7.4); clear smooth boundary.

Apk—11 to 26 inches; grayish brown (2.5Y 5/2) clay loam, dark olive gray (5Y 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and few fine roots; few very fine and fine tubular pores; slightly effervescent with disseminated carbonates and segregations of carbonates in few fine soft masses; few fine black (10YR 2/1) manganese concretions and stains; few fine distinct olive brown (2.5Y 4/4) masses of iron accumulations moist; slightly (pH 7.4)alkaline (pH 7.4); clear smooth boundary.

Bk1—26 to 35 inches; grayish brown (10YR 5/2) clay loam, olive gray (5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; few pressure faces on peds; strongly effervescent with segregations of carbonates in few fine soft masses; few fine black (10YR 2/1) manganese concretions and stains;

common fine distinct dark yellowish brown (10YR 4/6) masses of iron accumulations moist; slightly alkaline (pH 7.6); gradual smooth boundary.

Bk2—35 to 44 inches; grayish brown (10YR 5/2) clay loam, dark gray (5Y 4/1) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; few pressure faces on peds; slightly effervescent with segregations of carbonates in few fine soft masses; few fine black (10YR 2/1) manganese concretions and stains; common fine distinct dark yellowish brown (10YR 4/6) masses of iron accumulations moist; moderately alkaline (pH 7.9); gradual smooth boundary.

C—44 to 60 inches; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) clay loam, dark gray (5Y 4/1) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; few pressure faces on peds; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulations moist; moderately alkaline (pH 8.0).

Typical pedon location: Stanislaus County, California; 37 degrees 35 minutes 14 seconds north latitude, 121 degrees 12 minutes 07 seconds west longtitude (in an unsectionized area), Westley 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 2/1, 3/1, 4/1, or 5/1; 2.5Y 5/2; or 5Y, 4/1, 5/1, or 5/2. Moist color is 10YR 2/1, 3/1, 3/2, 4/1, 5/1; 5Y 3/1 or 3/2; or 2.5Y 2/2. Reaction is slightly alkaline or moderately alkaline.

The Bk horizon is 10YR 5/2 or 5/3 or 2.5Y 6/1. Moist color is 10YR 4/2 or 4/3 or 5Y 4/1 or 4/2.

The C horizon is 10YR 5/2, 5/4, 6/2, or 6/3; 5Y 5/2, 5/3, 6/1, or 6/2; or 2.5Y 5/4 or 6/4. Moist color is 5Y 4/1 or 4/2 or 2.5Y 4/2 or 5/2. Texture is sandy clay loam, clay loam, or clay.

El Solyo Series

The El Solyo series consists of very deep, well drained soils on low alluvial fans. These soils formed in alluvium from sedimentary and metamorphic rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, mixed, superactive, thermic Calcic Haploxerepts

Typical Pedon

El Solyo silty clay loam, 0 to 2 percent slopes

Ap—0 to 10 inches; pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine and few medium roots; many very fine tubular pores; neutral (pH 7.1); clear wavy boundary.

AB—10 to 17 inches; pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; hard, firm, very sticky and plastic; common very fine roots; many fine tubular and interstitial pores; slightly effervesecent with disseminated carbonates; slightly alkaline (pH 7.8); clear wavy boundary.

Bt—17 to 30 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium angular blocky structure; hard, firm, very sticky and plastic; common very fine roots; many very fine tubular pores; few thin clay films in pores; slightly effervescent with disseminated carbonates; slightly alkaline (pH 7.8); gradual wavy boundary.

Btk1—30 to 45 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; few pressure faces; strongly effervescent with common accumulations of segregated carbonates in fine soft masses and filaments; slightly alkaline (pH 7.8); gradual wavy boundary.

Btk2—45 to 60 inches; light yellowish brown (10YR 6/4) silty clay, brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few very fine tubular pores; few pressure faces; slightly effervescent with few accumulations of segregated carbonates in fine soft masses and filaments; slightly alkaline (pH 7.8).

Typical pedon location: Stanislaus County, California; 0.2 mile south of California State Highway 132 on McCracken Road, 30 feet west of McCracken Road; 1,500 feet south and 30 feet west of the northeast corner of section 35, T. 3 S., R. 6 E., 37 degrees 38 minutes 01 second north latitude, 121 degrees 16 minutes 07 seconds west longtitude, Vernalis 7.5 minute quadrangle.

Range in Characteristics

The depth to a marked increase in carbonates ranges from about 20 to 40 inches. Average clay content of the textural control section is 35 to 50 percent. Carbonates are segregated in filaments or soft masses at a depth of 25 to 35 inches.

The A horizon is 10YR 5/2, 5/3, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. Moist color is 10YR 3/2, 3/3, 4/2, or 4/3 or

2.5Y 3/2 or 4/2. Organic matter content is 0.5 to 2 percent. Reaction is neutral in the upper part of the horizon to slightly alkaline in the lower part. Texture is silty clay loam or clay loam.

The Bt horizon is 10YR 5/2, 5/3, 6/2, 6/3, or 6/4. Moist color is 10YR 3/2, 3/3, 4/2, 4/3, or 4/4. Reaction is slightly alkaline or moderately alkaline. Texture is silty clay loam or silty clay.

The Btk horizon is 10YR 5/2, 5/3, 6/2, 6/3, or 6/4. Moist color is 10YR 4/2, 4/3, or 4/4. Reaction is slightly alkaline or moderately alkaline. Texture is silty clay loam or silty clay.

Elsalado Series

The Elsalado series consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium from sandstone and shale. Slope ranges from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Fluventic Haploxerepts

Typical Pedon

Elsalado loam, 0 to 2 percent slopes, rarely flooded

Ap—0 to 6 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and few fine tubular pores; slightly effervescent with disseminated carbonate; moderately alkaline (pH 7.9); percent gravel; clear smooth boundary.

Bw1—6 to 18 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) loam, brown (10YR 4/3) and dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine and fine tubular pores; areas of worm castings and krotovinas that are slightly dark in color are slightly effervescent and light color are strongly effervescent with disseminated carbonate; moderately alkaline (pH 8.2); 5 percent gravel; gradual smooth boundary.

Bw2—18 to 26 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and common very fine and medium roots; common very fine and fine tubular and interstitial pores; strongly effervescent with disseminated carbonate; moderately alkaline (pH 8.4); 5 percent gravel; gradual smooth boundary.

Bk1—26 to 33 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine, medium and few coarse and very fine roots; common very fine and fine tubular and common very fine interstitial pores; strongly effervescent with segregations of carbonate in common, fine soft masses and seams; moderately alkaline (pH 8.4); 5 percent gravel; gradual smooth boundary.

Bk2—33 to 41 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium and coarse roots; common very fine and fine tubular and common very fine interstitial pores; violently effervescent with segregations of carbonate in common, fine soft masses and seams; moderately alkaline (pH 8.3); 5 percent gravel; gradual smooth boundary.

Bk3—41 to 48 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine and medium roots; common very fine, fine tubular and common very fine interstitial pores; slightly effervescent with segregations of carbonate in few, fine soft masses; moderately alkaline (pH 8.3); 5 percent gravel; gradual smooth boundary.

Bk4—48 to 60 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few medium roots; few very fine tubular and interstitial pores; slightly effervescent with segregations of carbonate in few, fine seams; moderately alkaline (pH 8.4); 5 percent gravel.

Typical pedon location: 600 feet north and 2,350 feet west of the southeast corner of section 13, T. 5 S., R. 7 E., 37 degrees 29 minutes 40 seconds north latitude, 121 degrees 08 minutes 53 seconds west longtitude, Patterson 7.5 minute quadrangle.

Range in Characteristics

The content of organic matter is 0.5 to 1.0 percent in the upper part and 0.2 to 0.5 percent in the lower part. Gravel content is 0 to 10 percent. Reaction is slightly alkaline or moderately alkaline.

The A horizon is 10YR 4/3, 5/2, or 5/3. Moist color is 10YR 3/2, 3/3, or 4/3. Texture is loam or fine sandy loam.

The Bw and Bk horizons are 10YR 5/2, 5/3, 5/4, or 6/4. Moist color is 10YR 4/2, 4/3, 4/4, 5/3, or 5/4. Texture is loam or fine sandy loam.

Franciscan Series

The Franciscan series consists of moderately deep, well drained soils dominantly on north-facing slopes on mountains. These soils formed in materials weathered from sandstone and shale. Slope ranges from 30 to 75 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Typic Argixerolls

Typical Pedon

Franciscan gravelly sandy loam, in an area of Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes

A—0 to 14 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine and medium roots; common very fine and fine tubular and interstitial pores; 15 percent gravel and 5 percent cobbles; neutral (pH 7.3); gradual wavy boundary.

Bt1—14 to 22 inches; brown (7.5YR 5/4) cobbly clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine, fine, medium and coarse roots; common very fine tubular and interstitial pores; few thin clay films on ped faces; 10 percent gravel and 15 percent cobbles; neutral (pH 7.3); clear wavy boundary.

Bt2—22 to 29 inches; brown (7.5YR 5/4) cobbly clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine and medium roots; many very fine tubular pores; common moderately thick clay films on ped faces; 10 percent gravel and 15 percent cobbles; neutral (pH 7.3); abrupt wavy boundary.

R—29 inches; sandstone.

Typical pedon location: Stanislaus County, California; 1,400 feet south and 500 feet west of the northeast corner of section 32, T. 5 S., R. 6 E., 37 degrees 27 minutes 41 seconds north latitude, 121 degrees 19 minutes 38 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Depth to sandstone is 20 to 40 inches. Reaction is slightly acid or neutral.

The A horizon is 7.5YR 5/2 or 10YR 5/2, 5/3, or 5/4. Moist color is 7.5YR 3/2 or 10YR 3/2 or 3/3. Texture is gravelly sandy loam or sandy loam with 0 to 25 percent gravel.

The Bt horizon is 7.5YR 5/4, 6/2, or 6/4 or 10YR 5/3, 5/4, or 6/2. Moist color is 10YR 3/4 or 4/4 or 7.5YR 3/2, 3/4, 4/4, or 4/6. Texture is gravelly loam, cobbly loam, gravelly sandy clay loam, cobbly clay loam, sandy clay loam, or clay loam with 5 to 35 percent rock fragments.

Gaviota Series

The Gaviota series consists of shallow, well drained soils on mountains. These soils formed in material weathered from hard metasandstone. Slope ranges from 30 to 75 percent.

Taxonomic class: Loamy, mixed superactive, nonacid, thermic Lithic Xerorthents

Typical Pedon

Gaviota gravelly loam, 30 to 75 percent slopes, eroded

A1—0 to 6 inches; brown (7.5YR 5/4) gravelly loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; neutral (pH 7.0); clear smooth boundary.

A2—6 to 10 inches; brown (7.5YR 5/4) gravelly loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; neutral (pH 6.8); abrupt wavy boundary.

R—10 to 17 inches; pale brown (10YR 6/3) hard metasandstone.

Typical pedon location: Stanislaus County, California; 1,700 feet north and 500 feet east of the southwest corner of section 6, T. 5 S., R. 6 E., 37 degrees 32 minutes 05 seconds north latitude, 121 degrees 21 minutes 25 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Depth to hard metasandstone is 10 to 20 inches. The soils have wide variations in depth within short distances.

The A horizon is 10YR 4/3, 5/2, 5/3, 5/4, 5/6, 6/2, 6/3, or 6/4 or 7.5YR 5/2, 5/4, or 6/4. Moist color is 10YR 3/3, 4/2, 4/3, or 4/4 or 7.5YR 3/4, 4/2, 4/4, or 4/6. Reaction is moderately acid to neutral. Texture is gravelly loam or loam with 0 to 35 percent gravel.

Gonzaga Series

The Gonzaga series consists of moderately deep, well drained soils dominantly on north-facing slopes

on mountains. These soils formed in material weathered from shale. Slope ranges from 30 to 75 percent.

Taxonomic class: Fine, mixed, superactive, thermic Typic Palexerolls

Typical Pedon

Gonzaga loam, in an area of Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes

A—0 to 18 inches; brown (10YR 5/3) loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few fine and many very fine roots; common very fine tubular pores and common very fine interstitial pores; 5 percent gravel and 5 percent cobbles; neutral (pH 7.2); clear wavy boundary.

ABt—18 to 29 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots and common very fine roots; common very fine tubular pores and few very fine interstitial pores; 15 percent gravel and 5 percent cobbles; neutral (pH 7.3); abrupt wavy boundary.

Bt—29 to 38 inches; yellowish red (5YR 5/6) gravelly clay, yellowish red (5YR 4/6) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few very fine and medium roots; few very fine tubular pores; common moderately thick clay films on faces of peds and lining tubular pores; 15 percent gravel; slightly alkaline (pH 7.5); abrupt wavy boundary.

R—38 inches; light yellowish brown and yellowish brown (10YR 6/4 or 5/4) fractured hard shale.

Typical pedon location: Stanislaus County, California; 2,100 feet south and 800 feet west of the northeast corner of section 32, T. 5 S., R. 6 E., 37 degrees 27 minutes 41 seconds north latitude, 121 degrees 25 minutes 35 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Depth to hard shale ranges from 20 to 40 inches.

The A horizon is 10YR 5/2 or 5/3. Moist color is 7.5YR 3/2 or 10YR 3/2 or 3/3. Reaction is slightly acid or neutral. The AB horizon has dry color of 7.5YR 5/4 or 10YR 5/2 or 5/3 and moist color of 7.5YR 3/2 or 3/4 or 10YR 3/2 or 3/3. Texture is gravelly loam, gravelly sandy clay loam, sandy clay loam, loam, or clay loam with 5 to 30 percent rock fragments.

The Bt horizon is 5YR 4/6, 5/4, or 5/6 or 7.5YR 4/6, 5/4, or 5/6. Moist color is 2.5YR 3/6; 5YR 4/2, 4/4, 4/6, or 5/4; or 7.5YR 4/4, 4/6, 5/4, or 5/6. Texture is gravelly clay loam, gravelly clay, gravelly sandy clay, clay loam, clay, or sandy clay with 5 to 30 percent rock fragments. Reaction is neutral or slightly alkaline.

Henneke Series

The Henneke series consists of shallow, well drained soils on mountains. These soils formed in material weathered from serpentine rock. Slope ranges from 30 to 70 percent.

Taxonomic class: Clayey-skeletal, magnesic, thermic, Lithic Argixerolls

Typical Pedon

Henneke gravelly loam, in an area of Henneke-Hentine-Rock outcrop complex, 30 to 70 percent slopes

A—0 to 5 inches; reddish brown (5YR 4/3) gravelly loam, dark reddish brown (5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine interstitial pores; 15 percent 0.25- to 1-inch angular gravel fragments of serpentine; neutral (pH 7.3); abrupt smooth boundary.

BAt—5 to 9 inches; dark reddish brown (2.5YR 3/4) gravelly clay loam, dusky red (2.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine, fine and medium roots; few very fine tubular pores; few thin clay films lining pores; 30 percent 0.25- to 1-inch angular gravel fragments of serpentine; neutral (pH 7.3); abrupt smooth boundary.

Bt—9 to 19 inches; reddish brown (2.5YR 4/4) very gravelly clay, dark reddish brown (2.5YR 3/4) moist; strong medium subangular blocky structure; slightly hard, firm, sticky and plastic; few fine and medium roots; few very fine tubular pores; common moderately thick clay films on ped faces and lining pores; 60 percent 0.25- to 1.5-inch angular gravel fragments of serpentine; neutral (pH 7.2); abrupt wavy boundary.

R—19 inches; pale green (5G 7/2) and grayish green (5G 5/2) serpentine rock;

Typical pedon location: Stanislaus County, California; 2,500 feet north and 2,300 feet west of the southeast corner of section 21, T. 7 S., R. 6 E., 37 degrees 18 minutes 38 seconds north latitude, 121 degrees 19 minutes 05 seconds west longtitude, Wilcox Ridge 7.5 minute quadrangle.

Range in Characteristics

Depth to hard serpentine ranges from 10 to 20 inches. Reaction is neutral or slightly alkaline. The control section has 35 to 45 percent clay and 40 to 60 percent serpentine gravel.

The A horizon is 7.5YR 4/2, 4/4, or 5/2 or 5YR 4/3 or 5/4. Moist color is 7.5YR 3/2 or 3/3 or 5YR 3/2 or 3/3. This horizon has 15 to 35 percent rock fragments.

The Bt horizon is 7.5YR 5/2, 4/2, or 4/4; 5YR 3/2, 3/3, 3/4, or 4/4; or 2.5YR 3/4 or 4/4. Moist color is 7.5YR 3/2 or 3/4; 5YR 3/2, 3/3, or 4/4; or 2.5YR 3/2 or 3/4. Texture is very gravelly clay loam or very gravelly clay with 35 to 60 percent rock fragments.

Hentine Series

The Hentine series consists of shallow, well drained soils on mountains. These soils formed in material weathered from serpentine rock. Slope ranges from 30 to 70 percent.

Taxonomic class: Loamy-skeletal, magnesic, thermic, Lithic Argixerolls

Typical Pedon

Hentine gravelly loam, in an area of Henneke-Hentine-Rock outcrop complex, 30 to 70 percent slopes

A—0 to 4 inches; brown (7.5YR 4/2) gravelly loam, dark brown (7.5YR 3/2) moist; medium subangular blocky structure; slightly hard, friable, sightly sticky and slightly plastic; common very fine and few fine and medium roots; common very fine and fine tubular pores; 20 percent gravel fragments of serpentine 1/8 inch to 3 inches in size; neutral (pH 7.0); clear smooth boundary.

Bt1—4 to 10 inches; brown (7.5YR 4/4) very gravelly clay loam, dark brown (7.5YR 3/3) moist; moderately fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and few fine roots; few very fine, fine and medium tubular pores; common moderately thick clay films on ped faces and lining pores; 45 percent gravel fragments of serpentine 1/8 inch to 2 inches in size; slightly alkaline (pH 7.4); clear smooth boundary.

Bt2—10 to 17 inches; brown (7.5YR 4/4) very gravelly clay loam, dark brown (7.5YR 3/4) moist; massive; hard, firm, sticky and plastic; common fine and few very fine roots; common very fine and fine interstitial pores; few thin clay films on ped faces; 60 percent gravel fragments of serpentine 1/8 inch to 2 inches is size; slightly alkaline (pH 7.6); clear smooth boundary.

R—17 inches; white (N 8/0) and greenish gray (5G 6/1) serpentine rock.

Typical pedon location: Stanislaus County, California; 700 feet south and 200 feet west of the northeast corner of section 20, T. 7 S., R. 6 E., 37 degrees 18 minutes 57 seconds north latitude, 121 degrees 19 minutes 42 seconds west longtitude, Wilcox Ridge 7.5 minute quadrangle.

Range in Characteristics

Depth to hard serpentine ranges from 10 to 20 inches.

The A horizon is 7.5YR 4/2, 4/4, or 5/2. Moist color is 7.5YR 3/2. Texture is gravelly loam or very cobbly loam with 15 to 60 percent rock fragments. Reaction is neutral or slightly alkaline.

The Bt horizon is 7.5YR 3/4, 4/4, or 5/2. Moist color is 7.5YR 3/2, 3/3, or 3/4. Texture is very gravelly loam or very gravelly clay loam 35 to 75 percent rock fragments. Reaction is slightly alkaline or moderately alkaline.

Honker Series

The Honker series consists of moderately deep, well drained soils dominantly on south-facing slopes on mountains. These soils formed in material weathered from sandstone. Slope ranges from 30 to 75 percent.

Taxonomic class: Fine, mixed, superactive, thermic Mollic Palexeralfs

Typical Pedon

Honker sandy loam, in an area of Honker-Vallecitos-Honker,eroded,complex, 30 to 50 percent slopes

A—0 to 7 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and few fine roots; common very fine tubular pores; 10 percent gravel; neutral (pH 6.8); abrupt wavy boundary.

BAt—7 to 16 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; common thin clay films on ped faces and lining pores; 10 percent gravel; neutral (pH 6.7); abrupt wavy boundary.

Bt1—16 to 23 inches; red (2.5YR 5/6) gravelly clay, red (2.5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm, very sticky

and very plastic; few very roots; common very fine tubular pores; common moderately thick clay films on ped faces and lining pores; 20 percent gravel; neutral (pH 6.7); gradual smooth boundary.

Bt2—23 to 36 inches; red (2.5YR 5/6) gravelly clay, red (2.5YR 4/6) moist; moderate coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine tubular pores; common moderately thick clay films on ped faces and lining pores; 20 percent gravel; neutral (pH 6.6); abrupt wavy boundary.

R—36 inches; reddish brown (2.5YR 4/4) hard sandstone.

Typical pedon location: Stanislaus County, California; 2,400 feet north and 2,150 feet east of the southwest corner of section 28, T. 5 S., R. 5 E., 37 degrees 28 minutes 15 seconds north latitude, 121 degrees 18 minutes 50 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Depth to a hard sandstone ranges from 20 to 40 inches.

The A horizon is 7.5YR 5/4, 6/2, or 6/4 or 10YR 5/3 or 6/2. Moist color is 7.5YR 3/2 or 3/4 or 10YR 3/2 or 3/3. Texture is sandy loam or gravelly loam with 0 to 25 percent rock fragments. Reaction is slightly acid or neutral.

The Bt horizon is 2.5YR 5/4, 5/6, 6/4, or 6/6; 5YR 5/3, 5/4, 5/5, 6/3, or 6/4; or 7.5YR 5/4, 5/6, 6/4, or 6/6. Moist color is 2.5Y 4/6, 5YR 4/4 or 4/6, or 7.5YR 4/4 or 5/6. Texture is gravelly clay loam, gravelly clay, or gravelly sandy clay with 35 to 55 percent clay and 15 to 30 percent rock fragments. Reaction is neutral or slightly alkaline.

Hytop Series

The Hytop series consists of moderately deep, well drained soils dominantly on north-facing slopes on mountains. Theses soils formed in material weathered from basalt. Slope ranges from 50 to 75 percent.

Taxonomic class: Fine, mixed, superactive, thermic Typic Palexeralfs

Typical Pedon

Hytop loam, in an area of Hytop-Franciscan-Vallecitos complex, 50 to 75 percent slopes

A—0 to 11 inches; brown (7.5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak fine granular structure; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; 5 percent gravel; neutral (pH 7.3); abrupt smooth boundary.

Bt1—11 to 26 inches; yellowish red (5YR 5/6) clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine and common very fine roots; many very fine tubular pores; few thin clay films on ped faces and in pores; 5 percent gravel; neutral (pH 7.3); clear smooth boundary.

Bt2—26 to 39 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and few medium roots; common very fine tubular pores; common thin clay films on ped faces and in pores; 5 percent gravel; slightly alkaline (pH 7.4); abrupt wavy boundary.

Cr—39 inches; brownish yellow (10YR 6/6) and yellowish red (5YR 4/6) weathered basalt.

Typical pedon location: Stanislaus County, California; 1,350 feet north and 100 feet east of the southwest corner of section 22, T. 6 S, R. 6 E., 37 degrees, 23 minutes, 40 seconds north latitude, 121 degrees, 18 minutes, 48 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Depth to basalt ranges from 20 to 40 inches. Gravel content is 0 to 10 percent. Reaction is neutral or slightly alkaline.

The A horizon is 5YR 4/4; 7.5YR 4/2, 4/3, 5/2, or 5/4; or 10YR 5/3, 5/4, or 6/3. Moist color is 5YR 4/4; 7.5YR 4/2 or 4/4; or 10YR 4/2, 4/4, or 5/4.

The Bt horizon is 2.5YR 5/4; 5YR 5/2, 5/4, or 5/6; 7.5YR 4/4 or 5/4; or 10YR 5/4 or 5/6. Moist color is 2.5YR 4/4, 5YR 4/2 or 4/4, 7.5YR 4/4 or 5/6, or 10YR 4/3 or 4/4. Texture is clay loam or clay.

Merritt Series

The Merritt series consists of very deep, poorly drained soils on flood plains. These soils formed in alluvium from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine-silty, mixed, superactive, thermic Fluvaquentic Haploxerolls

Typical Pedon

Merritt silty clay loam, partially drained, 0 to 2 percent slopes, rarely flooded

Ap—0 to 12 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2)

moist; moderate medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine, fine and medium roots; few very fine tubular and interstitial pores; neutral (pH 7.1); clear smooth boundary.

Bw1—12 to 21 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine, fine and medium roots; few very fine tubular and interstitial pores; neutral (pH 7.3); gradual smooth boundary.

Bw1—21 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam, dark olive gray (5Y 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; common very fine tubular and interstitial pores; few fine distinct strong brown (7.5YR 5/8) and yellowish brown (10YR 5/4) masses of iron accumulations moist; neutral (pH 7.3); abrupt smooth boundary.

Bk—30 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; many very fine tubular pores and few very fine interstitial pores; few fine distinct yellowish brown (10YR 6/4) and brown (7.5YR 5/4) masses of iron accumulations moist; violently effervescent with disseminated carbonates and with segregations of carbonates in common fine soft masses; moderately alkaline (pH 8.1); clear smooth boundary.

C1—38 to 46 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores and few very fine interstitial pores; moderately alkaline (pH 8.0); clear smooth boundary.

C2—46 to 60 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; moderately alkaline (pH 8.0).

Typical pedon location: Stanislaus County, California; 37 degrees 36 minutes 40 seconds north latitude, 121 degrees 11 minutes 47 seconds west longtitude (in an unsectionized area), Westley 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 4/1, 5/1, or 5/2 or 2.5Y 5/2. Moist color is 10YR 3/1 or 3/2, 2.5Y 3/2, or 5Y 3/1 or 3/2. Reaction is neutral to moderately alkaline. The content of organic matter ranges from 1 to 4 percent.

The Bw and Bk horizons are 10YR 4/2, 5/2, or 6/2 or 2.5Y 5/2. Moist color is 10YR 3/1, 3/3, 4/1, 4/2, 4/3, or 5/2; 2.5Y 4/2; or 5Y 3/2. Redoximorphic features are distinct or prominent. Texture is silt loam or silty clay loam. The Bk horizon contains disseminated and segregated carbonates. The content of organic matter is 0 to 1 percent.

The C horizon is 10YR 5/2 or 2.5Y 5/2. Moist color is 10YR 4/2 or 4/3 or 2.5Y 4/2. Redoximorphic features are distinct or prominent. Texture is stratified loamy fine sand to silt loam. Reaction is slightly alkaline to strongly alkaline.

Millsholm Series

The Millsholm series consists of shallow, well drained soils on mountains. These soils formed in material weathered from sandstone and shale. Slope ranges from 30 to 75 percent.

Taxonomic class: Loamy, mixed, superactive, thermic Lithic Haploxerepts

Typical Pedon

Millsholm loam, in an area of Millsholm-Honker-Rock outcrop 30 to 50 percent slopes

A—0 to 6 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium platy structure; slightly hard, friable, nonsticky and nonplastic; common fine roots; common fine pores; slightly acid (pH 6.4); abrupt smooth boundary.

Bt1—6 to 12 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; hard, friable, sticky and nonplastic; common fine roots; common fine pores; few shale fragments; neutral (pH 7.0); clear smooth boundary.

Bt2—12 to 19 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, sticky and slightly plastic; few fine, many medium and coarse roots; common medium and fine pores; few thin discontinuous clay films; few shale fragments; neutral (pH 7.0); clear wavy boundary.

R—19 inches; hard fractured shale

Typical pedon location: Stanislaus County, California; 2,100 feet south and 800 feet west of the northeast corner of section 32, T. 5 S., R. 6 E., 37 degrees 27 minutes 41 seconds north latitude, 121 degrees 25 minutes 35 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Thickness of solum and depth to bedrock are about 15 to 20 inches. There are up to 35 percent shale fragments throughout the soils.

The A horizon is 10YR 7/4, 7/3, 6/3, 6/2, 6/4, 5/3, 5/4, 4/2, or 4/3 or 2.5Y 5/2 or 5/4. Moist color is 10YR 4/2, 4/3, 4/4, 3/4, or 5/4 or 7.5YR 3/4.

The Bt horizon is 10YR, 2.5Y, and/or 7.5YR 4/2, 4/3, 4/4, 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4. Moist color commonly is 4/2, 4/3, 4/4, or 5/4 in same hues. This horizon has about 20 to 30 percent clay, but the increase from the A horizon to the B horizon is not sufficient to qualify the B horizon as an argillic horizon. A few thin clay films are evident in most pedons.

Oneil Series

The Oneil series consists of moderately deep, well drained soils on foothills. These soils formed in material weathered from calcareous sandstone and shale. Slope ranges from 15 to 50 percent.

Taxonomic class: Fine-silty, mixed, superactive, thermic Calcic Haploxerolls

Typical Pedon

Oneil silt loam, in an area of Ayar-Oneil complex, 30 to 50 percent slopes

A1—0 to 7 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; slightly effervescent with disseminated carbonates and segregated as few fine irregular hard masses; moderately alkaline (pH 8.0); clear smooth boundary.

A2—7 to 14 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium and coarse angular blocky structure; hard, friable, sticky and plastic; common very fine roots; few very fine tubular pores; strongly effervescent with disseminated carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

Ck1—14 to 20 inches; brown (10YR 5/3) silt loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; hard, friable, sticky and slightly plastic; few fine roots; few very fine tubular pores; strongly effervescent with disseminated carbonates and segregated as common fine threads; moderately alkaline (pH 8.4); clear smooth boundary.

Ck2—20 to 30 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; 5 percent gravel; strongly effervescent with disseminated carbonates and segregated as common fine threads; moderately alkaline (pH 8.4); abrupt wavy boundary.

R—30 inches; unweathered calcareous sandstone.

Typical pedon location: Stanislaus County, California; 1800 feet south and 1500 feet east of the northwest corner of section 7, T. 5 S., R. 7 E., 37 degrees 31 minutes 02 seconds north latitude, 121 degrees 14 minutes 37 seconds west longtitude, Westley 7.5 minute quadrangle.

Range in Characteristics

Depth to a lithic contact ranges from 20 to 40 inches.

The A horizon is 10YR 4/4 or 5/3. Moist color is 10YR 3/2 or 3/3 and can be 4/4 in the lower part. Texture is silt loam, or silty clay loam with 20 to 35 percent clay and 50 to 70 percent silt. The content of organic matter ranges from 1 to 3 percent but is less than 1 percent below a depth of 14 inches.

The C horizon is 10YR 5/4or 6/4. Moist color is 10YR 3/3, 3/4, 4/3, 4/4, or 5/4. Texture is silt loam or silty clay loam with 5 to 10 percent rock fragments.

Oquin Series

The Oquin series consists of moderately deep, well drained soils on low foothills. These soils formed in material weathered from calcareous sandstone. Slope ranges from 15 to 30 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Calcic Haploxerolls

Typical Pedon

Oquin fine sandy loam, 15 to 30 percent slopes

A1—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic, many very fine roots; few very fine tubular and common very fine interstitial pores; slightly effervescent with disseminated carbonates and segregated as few fine soft masses and concretions; moderately alkaline (pH 8.0); clear smooth boundary.

A2—8 to 14 inches; grayish brown (10YR 5/2) fine sandy loam very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; few very fine tubular and common very fine interstitial pores; slightly

effervescent with disseminated carbonates and segregated as few fine soft masses and concretions; moderately alkaline (pH 8.0); clear wavy boundary.

Ak—14 to 24 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular and common very fine interstitial pores; strongly effervescent with disseminated carbonates and segregated as few fine soft masses and concretions; moderately alkaline (pH 8.0); clear smooth boundary.

Ck—24 to 31 inches; light brownish gray (10YR 6/2) sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular and interstitial pores; strongly effervescent with disseminated carbonates and segregated as common fine soft masses and concretions; moderately alkaline (pH 8.0); abrupt wavy boundary.

Cr—31 inches; strongly weathered calcareous sandstone.

Typical pedon location: Merced County, California; about 6 miles west southwest of the city of Gustine, 600 feet east and 550 feet north of the SW corner of section 21, T. 8 S., R. 9 E., Howard Ranch 7.5 minute quadrangle.

Range in Characteristics

Depth to the paralithic contact ranges from 20 to 40 inches. Clay content is 12 to 18. The soils are slightly alkaline or moderately alkaline. Segregated carbonates are throughout most pedons as soft masses, filaments, or concretions.

The A horizon is 10YR 3/2, 3/3, 4/2, 4/3, 5/2, or 5/3. Moist color is 10YR 2/2, 3/2, or 3/3. The content of organic matter is 1 to 3 percent. This horizon is slightly effervescent to strongly effervescent.

The C horizon is 10YR 4/3, 5/3, 5/4, 6/2, or 6/3. Moist color is 10YR 3/3, 3/4, 4/3, or 4/4. Texture is sandy loam, fine sandy loam, or loam. This horizon is strongly effervescent to violently effervescent.

Orognen Series

The Orognen series consists of very deep, well drained soils are on high elevation and uplifted dissected terraces. These soils formed in alluvium from mixed rock sources. Slope ranges from 8 to 50 percent.

Taxonomic class: Fine, mixed, superactive, thermic Typic Palexeralfs

Typical Pedon

Orognen sandy loam, 8 to 30 percent slopes

A1—0 to 5 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine roots; few very fine tubular and interstitial pores; 10 percent gravel; slightly alkaline (pH 7.6); clear wavy boundary.

Bt—5 to 19 inches; brown (7.5YR 5/4) gravelly sandy clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores and few very fine interstitial pores; 15 percent gravel; slightly alkaline (pH 7.6); abrupt smooth boundary.

2Bt1—19 to 33 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores and few very fine interstitial pores; few moderately thick clay films on ped faces and lining pores; 10 percent gravel; slightly alkaline (pH 7.8); clear wavy boundary.

2Bt2—33 to 47 inches; brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine tubular pores; few moderately thick clay films on ped faces and lining pores; 10 percent gravel; slightly alkaline (pH 7.8); clear smooth boundary.

2Bt3—47 to 60 inches; light brown (7.5YR 6/4) clay loam, reddish brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine tubular pores; few moderately thick clay films on ped faces and lining pores; 10 percent gravel; moderately alkaline (pH 8.0); abrupt smooth boundary.

Typical pedon location: Stanislaus County, California; 900 feet north and 1,750 feet west of the southeast corner of section 6, T. 5 S., R. 6 E., 37 degrees 31 minutes 31 seconds north latitude, 121 degrees 20 minutes 44 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 7.5YR 5/4 or 6/4 or 10YR 5/3 or 6/4. Moist color is 7.5YR 3/4, 4/4, or 5/4 or 10YR 3/2, 3/3, or 4/4. Texture is sandy loam, loam, sandy clay

loam, gravelly sandy clay loam, or gravelly clay loam. Reaction is neutral or slightly alkaline.

The Bt horizon is 5YR 4/4, 4/6, or 5/4 or 7.5YR 5/4 or 6/4. Moist color is 5YR 3/4, 4/4, or 4/6 or 7.5YR 4/4 or 5/4. Texture is clay, sandy clay, clay loam, gravelly clay, or gravelly clay loam. Reaction is neutral to moderately alkaline.

The Orognen soils in map units 290 and 291 are taxadjuncts to the series and classify as fine, mixed, thermic Mollic Palexeralfs. They have more than 1 percent organic matter in the upper 6 inches and have a surface layer of gravelly clay loam. These differences, however, do not significantly affect the use and management of the soils.

Pedcat Series

The Pedcat series consists of very deep, poorly drained soils on low alluvial fans. These soils formed in alluvium from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, mixed, superactive, thermic Aquic Natrixeralfs

Typical Pedon

Pedcat clay loam, 0 to 2 percent slopes, rarely flooded

A—0 to 3 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many fine roots; few very fine and fine tubular pores; neutral (pH 7.0); clear smooth boundary.

E—3 to 7 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; common very fine tubular pores; few fine very dark gray (10YR 3/1) manganese stains; neutral (pH 7.0); clear smooth boundary.

Btkn1—7 to 25 inches; brown (10YR 5/3) and yellowish brown (10YR 5/4) clay, dark grayish brown (10YR 4/2) moist; few fine distinct dark brown (7.5YR 3/3) masses of iron accumulations, moist; strong medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; common moderately thick clay films lining pores; strongly effervescent with segregations of carbonates in few fine soft masses; moderately alkaline (pH 8.2); abrupt wavy boundary.

Btkn2—25 to 36 inches; yellowish brown (10YR 5/4) clay, brown (10YR 4/3) moist; few fine distinct dark brown (7.5YR 3/2) masses of iron accumulations, moist; moderate medium subangular blocky structure; slightly hard, firm, very sticky and plastic; few very fine roots; few very fine tubular pores; few moderately thick clay films on ped faces; violently effervescent with segregations of carbonates in common fine soft masses; few fine very dark gray (10YR 3/1) manganese stains; strongly alkaline (pH 8.8); clear smooth boundary.

Btkn3—36 to 51 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; few fine distinct dark brown (7.5YR 3/4) masses of iron accumulations, moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine tubular pores; few thin clay films on ped faces; violently effervescent with segregations of carbonates in common fine soft masses; few fine very dark gray (10YR 3/1) manganese stains; strongly alkaline (pH 8.9); clear smooth boundary.

C—51 to 60 inches; light yellowish brown (10YR 6/4) clay loam, brown (10YR 4/3) moist; weak moderate subangular blocky structure; slightly hard, friable, sticky and very plastic; few very fine roots; many very fine tubular pores; violently effervescent with disseminated carbonates; few fine very dark gray (10YR 3/1) manganese stains; strongly alkaline (pH 9.0).

Typical pedon location: Stanislaus County, California; about 1 mile northwest of Hills Ferry and 200 feet east of Azevedo Road.; 1,900 feet south and 200 feet east of the northwest corner of section 4, T. 7 S., R. 9 E., Gustine Quadrangle.

Range in Characteristics

The altered water table is artificially drained and maintained at a depth of 3.5 to 5 feet.

The A and E horizons are 10YR 4/2, 5/2, 5/3, 6/2, 6/4, 7/1, 7/3, or 7/4. Moist color is 10YR 2/2, 3/2, 3/3, 4/2, 4/3, 5/3, or 6/4. Reaction is neutral or slightly alkaline.

The Btkn horizon is 10YR 4/2, 5/1, 5/2, 5/3, 5/4, 6/2, 6/3, 6/4, or 6/6. Moist color is 10YR 3/2, 3/3, 4/2, 4/3, 4/4, 5/3, or 5/4. Texture is clay, silty clay loam, clay loam, or silty clay. Reaction is moderately alkaline or strongly alkaline.

The C horizon is 10YR 5/4, 6/4, 6/6, 7/3, 7/4, 7/6, or 8/6 or 2.5Y 5/4, 6/4, or 7/4. Moist color is 10YR 4/3, 4/4, 4/6, 5/4, 5/6, 6/4, or 7/4 or 2.5Y 3/2, 4/2, 4/4, or 5/2. Texture is clay loam to clay. Reaction is moderately alkaline or strongly alkaline.

Quinto Series

The Quinto series consists of shallow, somewhat excessively drained soils on. These soils formed in material weathered from sandstone conglomerate. Slope ranges from 30 to 75 percent.

Taxonomic class: Loamy, mixed, superactive, thermic Lithic Mollic Haploxeralfs

Typical Pedon

Quinto gravelly sandy loam, in an area of Quinto-Rock outcrop complex, 50 to 75 percent slopes

A—0 to 6 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, sticky and slightly plastic; common very fine roots; few very fine tubular pores; 15 percent gravel; neutral (pH 7.0); clear smooth boundary.

Bt—6 to 17 inches; brown (7.5YR 5/4) gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; few very fine tubular pores; few thin clay films bridging sand grains; neutral (pH 7.0); clear smooth boundary.

R—17 inches; sandstone conglomerate bedrock.

Typical pedon location: Merced County, California, about 11 miles west-southwest of the city of Gustine, in Quinto Creek Canyon, about 2,200 feet southeast of the Merced County-Stanislaus County boundary, 200 feet upslope (north) from Quinto Creek, 2,600 feet east and 900 feet south of the northwest corner of section 11, T. 9 S., R. 7 E., Crevison Peak Quadrangle

Range in Characteristics

Depth to a lithic contact ranges from 10 to 20 inches. About 25 to 50 percent of the original surface horizon has been lost through erosion. The content of rounded or angular rock fragments, mainly gravel, ranges from 15 to 35 percent throughout the profile.

The A horizon is 5YR 5/4; 7.5YR 4/6 or 5/4; or 10YR 5/3, 5/4, 6/3, or 6/4. Moist color is 5YR 3/4, 7.5YR 3/4, or 10YR 3/4. Clay content is 10 to 20 percent. Reaction is slightly acid or neutral. The content of organic matter is 1 to 3 percent.

The Bt horizon is 5YR 5/3, 5/4, or 5/6; 7.5YR 5/3, 5/4, or 6/4; or 10YR 5/4, 6/3, or 6/4. Moist color is 5YR 3/3, 3/4, 4/4, or 4/6; 7.5YR 3/4, 4/4, 4/6, or 5/4; or 10YR 4/3 or 4/4. Clay content is 20 to 35 percent. Reaction is slightly acid to slightly alkaline.

San Timoteo Series

The San Timoteo series consists of moderately deep, somewhat excessively drained soils on mountains. These soils formed in material weathered from calcareous sandstone or shale. Slope ranges from 30 to 75 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, calcareous, thermic Typic Xerorthents

Typical Pedon

San Timoteo sandy loam, in an area of Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes

A—0 to 5 inches; light brownish gray (10YR 6/2) sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; many very fine interstitial pores, common very fine and common fine tubular pores; slightly alkaline (pH 7.5); gradual smooth boundary.

C1—5 to 15 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and few fine tubular pores; slightly effervescent; moderately alkaline (pH 7.9); clear smooth boundary.

C2—15 to 22 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular and interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); abrupt wavy boundary.

Cr—22 inches; yellowish brown (10YR 5/4) highly fractured medium grained calcareous sandstone.

Typical pedon location: Stanislaus County, California; 2,500 feet north and 3,900 feet east of the southwest corner of section 12, T. 5 S., R. 6 E., 37 degrees 30 minutes 47 seconds north latitude, 121 degrees 15 minutes 00 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Depth to calcareous sandstone ranges from 20 to 40 inches. The soils have 8 to 18 percent clay. Reaction is slightly alkaline or moderately alkaline.

The A horizon is 10YR 5/2, 5/3, 6/2, 6/3, or 7/2 or 2.5Y 5/2. Moist color is 10YR 4/3 or 5/3.

The C horizon is 10YR 5/3, 5/4, 6/2, 6/3, 6/4, 7/2, or 7/3 or 2.5Y 6/2. Moist color is 10YR 4/3, 5/2, or 5/3. Texture is sandy loam or loam.

Sehorn Series

The Sehorn series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from sandstone and shale. Slope ranges from 30 to 50 percent.

Taxonomic class: Fine, smectitic, thermic Aridic Haploxererts

Typical Pedon

Sehorn clay, in an area of Sehorn-Contra Costa complex, 30 to 50 percent slopes

A1—0 to 3 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; strong medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; neutral (pH 6.8); clear smooth boundary.

A2—3 to 7 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; strong coarse and very coarse angular blocky structure; extremely hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; neutral (pH 7.0); clear smooth boundary.

Bss1—7 to 21 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; strong coarse and very coarse prismatic structure; very hard, friable, sticky and very plastic; few very fine roots; few very fine tubular pores; common slickensides; neutral (pH 7.0); gradual smooth wavy boundary.

Bss2—21 to 26 inches; strong brown (7.5YR 5/6) clay, light yellowish brown (10YR 6/4) moist; moderate coarse subangular blocky structure; very hard, friable, sticky and very plastic; few very fine roots; common very fine tubular pores; common slickensides; neutral (pH 7.0); gradual irregular boundary.

R—26 inches; hard fractured shale.

Typical pedon location: Merced County, California; 1,400 feet west and 800 feet south of the northeast corner of section 11, T. 9 S., R. 7 E., Crevision Peak 7.5 minute quadrangle.

Range in Characteristics

Depth to the bedrock is 20 to 40 inches. Cracks 3/8 to 1 inch wide develop in the soils during late May and June. They remain open until October and November and are closed during the rest of the year. The cracks extend from the surface to a depth of 20 inches or down to shale bedrock.

The A horizon is 10YR 5/3 or 5/4 or 7.5YR 5/4 or 5/6. Moist color is 10YR 4/3 or 4/4 or 7.5YR 4/4 or 4/6. Reaction is slightly acid or neutral.

The Bss horizon is 10YR 5/4 or 6/4 or 7.5YR 5/4 or 5/6. Moist color is 10YR 4/4 or 5/6 or 7.5YR 4/4 or 4/6. Reaction is neutral or slightly alkaline.

The Sehorn soils in this survey area have hue of 7.5YR, which is outside the range of the series. This difference, however, does not effect the use and management of the soils.

Stomar Series

The Stomar series consists of very deep, well drained soils on dissected alluvial fans. These soils formed in alluvium from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine, smectitic, thermic Mollic Haploxeralfs

Typical Pedon

Stomar clay loam, 0 to 2 percent slopes

Ap—0 to 11 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; organic carbon of 1.2 (UC Davis Lab.) neutral (pH 6.8); clear smooth boundary.

A—11 to 20 inches; yellowish brown (10YR 5/4) clay loam, dark grayish brown (10YR 4/2) moist; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; neutral (pH 6.8); clear smooth boundary.

Bt1—20 to 26 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; weak coarse angular blocky structure parting to weak fine subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; many thin clay films on faces of peds and lining pores; neutral (pH 7.1); gradual wavy boundary.

Bt2—26 to 38 inches; yellowish brown (10YR 5/4) clay, brown (10YR 4/3) moist; moderate coarse angular blocky structure parting to weak fine subangular blocky; very hard, firm, sticky and plastic; common very fine roots; common fine and very fine tubular and interstitial pores; many moderately thick clay films on ped faces and lining pores and as bridges between mineral grains; slightly alkaline (pH 7.5); abrupt smooth boundary.

Btk—38 to 60 inches; light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; many fine and very fine

tubular and interstitial pores; many moderately thick clay films lining pores and as bridges between mineral grains; slightly calcareous with lime disseminated and as few fine threads; thin, discontinuous lenses of silt or silt loam; slightly alkaline (pH 7.8).

Typical pedon location: Stanislaus County, California; 0.25 mile south of Marshall Road and 0.25 mile east of Davis Road; 1,300 feet south and 1,500 feet east of the northwest corner of section 8, T. 6 S., R. 8 E., 37 degrees 25 minutes 52 seconds north latitude, 121 degrees 06 minutes 53 seconds west longtitude, Crows Landing 7.5 minute quadrangle.

Range in Characteristics

Depth to the Btk horizon is 26 to 50 inches. The content of organic matter in the upper 10 inches is 1 to 2 percent.

The A horizon is 10YR 5/1, 5/2, 5/3, 5/4, 4/1, 4/2, or 4/3; 7.5YR 5/4; or 2.5Y 5/2. Moist color is 10YR 3/1, 3/2, or 3/3 or 7.5YR 3/3. Texture is loam, clay loam, or silty clay loam.

The Bt horizon is 10YR 4/1, 4/2, 5/2, 5/3, 6/3, 5/4, 6/4, or 6/2; 7.5YR 5/4 or 6/4; or 2.5Y 5/2 or 5/4. Moist color is 10YR 3/1, 3/2, 3/3, 4/2, 4/3, 4/4, 4/6, 5/2, or 5/3; 7.5YR 4/3, 4/4, or 5/3; or 2.5Y 4/4, 4/2, or 3/2. Texture is clay loam, clay, or gravelly clay. Reaction is neutral to moderately alkaline.

The Btk horizon is 10YR 5/3, 5/4, 5/6, 6/3, or 6/4; 7.5YR 5/4; or 2.5Y 6/4 or 7/4. Moist color is 10YR 6/4, 5/6, 5/4, 5/3, 4/4, 4/3, or 3/3; 7.5YR 4/4; or 2.5Y 5/4. Texture is clay, clay loam, silty clay loam, or gravelly clay loam. Reaction is slightly alkaline or moderately alkaline.

Stonyford Series

The Stonyford series consists of shallow, well drained soils on mountains. These soils formed in material weathered from hard igneous rock. Slope ranges from 15 to 50 percent.

Taxonomic class: Loamy, mixed, superactive, thermic Lithic Haploxeralfs

Typical Pedon

Stonyford gravelly loam, 15 to 50 percent slopes

A—0 to 6 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial pores; neutral (pH 6.8); clear wavy boundary.

Bt1—6 to 12 inches; brown (7.5YR 5/4) gravelly clay loam, brown (7.5YR 4/4) moist; strong medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; common very fine tubular pores; neutral (pH 7.0); clear wavy boundary.

Bt2—12 to 17 inches; light brown (7.5YR 6/4) gravelly clay loam, brown (7.5YR 4/4) moist; strong medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; common very fine tubular pores; neutral (pH 7.0); clear wavy boundary.

R—17 inches; white (10YR 8/1) and black (N 2/0) mottled hard fractured igneous rock.

Typical pedon location: Stanislaus County, California; 1,800 feet south and 2,600 feet east of the northwest corner of section 24, T. 6 S., R. 5 E., 37 degrees 23 minutes 32 seconds north latitude, 121 degrees 22 minutes 38 seconds west longtitude, Mt. Boardman 7.5 minute quadrangle.

Range in Characteristics

Depth to hard igneous rock is 10 to 20 inches. The soils have wide variations in depth within short distances.

The A horizon is 7.5YR 5/2, 5/4, or 6/4. Moist color is 7.5YR 3/2 or 3/4. Reaction is neutral. Gravel content is 15 to 35 percent.

The Bt horizon is 7.5YR 6/4, 5/4, or 4/4 or 5YR 4/4. Moist color is 7.5YR 3/4 or 4/4 or 5YR 3/4. Reaction is neutral. Gravel content is 15 to 35 percent.

The Stonyford soils in this survey area have lower rainfall than is defined as the range for the series and may have a higher base saturation. These differences, however, do not significantly affect the use and management of the soils.

Vallecitos Series

The Vallecitos series consists of shallow, well drained soils dominantly on south-facing slopes on mountains. These soils formed in material weathered from sandstone. Slope ranges from 30 to 75 percent.

Taxonomic class: Clayey, smectitic, thermic Lithic Ruptic-Xerochreptic Haploxeralfs

Typical Pedon

Vallecitos gravelly loam, in an area of Honker-Vallecitos-Honker,eroded,complex, 30 to 50 percent slopes

A—0 to 7 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common very fine interstitial pores and few very fine tubular pores; 25 percent gravel; neutral (pH 6.9); abrupt wavy boundary.

Bt1—7 to 16 inches; brown (7.5YR 5/4) gravelly clay, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; common very fine tubular and interstitial pores; few thin clay films on faces of peds and clay films lining tubular and interstitial pores; 25 percent gravel; neutral (pH 7.3); abrupt wavy boundary.

R—16 inches; brown (7.5YR 5/4) fractured hard sandstone.

Typical pedon location: Stanislaus County, California; 2,650 feet north and 2,350 feet east of the southwest corner of section 28, T. 5 S., R. 5 E., 37 degrees 28 minutes 15 seconds north latitude, 121 degrees 18 minutes 50 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Depth to hard sandstone ranges from 10 to 20 inches.

The A horizon is 7.5YR 5/2, 5/4, or 6/2 or 10YR 5/2, 5/3, 5/4, or 6/3. Moist color is 7.5YR 3/2, 3/4, or 4/2 or 10YR 3/3, 4/2, or 4/3. Content of gravel is 15 to 25 percent.

The Bt horizon is 5YR 5/4, 5/6, 6/3, or 6/4; 7.5YR 4/4, 5/4, 6/2, or 6/4; or 10YR 4/3, 6/2, or 6/3. Moist color is 5YR 4/3 or 4/4; 7.5YR 4/2 or 4/4; or 10YR 3/3, 4/2, or 4/3. Texture is gravelly loam or gravelly clay. Content of gravel is 15 to 30 percent.

Vaquero Series

The Vaquero series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from sandstone. Slope ranges from 8 to 50 percent.

Taxonomic class: Fine, smectitic, thermic Aridic Haploxererts

Typical Pedon

Vaquero clay, in an area of Alo-Vaquero complex, 30 to 50 percent slopes

A—0 to 6 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; many very fine roots; common very fine tubular pores; pressure faces; slightly effervescent with disseminated carbonates; slightly alkaline (pH 7.4); clear smooth boundary.

Bss—6 to 13 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate medium prismatic structure; hard, firm, sticky and very plastic; common very fine roots; common very fine tubular pores; dark gray (10YR 4/1) manganese concretions; common intersecting slickensides; slightly effervescent with disseminated carbonates; slightly alkaline (pH 7.4); clear smooth boundary.

Bssk1—13 to 21 inches; brown (10YR 5/3) clay, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure; hard, firm, sticky and very plastic; few very fine roots; common very fine tubular pores; few fine crystals of gypsum; strongly effervescent with segregations of carbonates in few fine soft masses; common intersecting slickensides; slightly alkaline (pH 7.4); clear wavy boundary.

Bssk2—21 to 35 inches; brown (10YR 5/3) clay, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure; hard, firm, sticky and very plastic; common very fine tubular pores; few fine crystals of gypsum; strongly effervescent with segregations of carbonates in common medium soft masses and in few fine filaments; common intersecting slickensides; slightly alkaline (pH 7.5); clear smooth boundary.

Cr—35 inches; light gray (10YR 7/2) and grayish brown (10YR 5/2) highly weathered calcareous sandstone.

Typical pedon location: Stanislaus County, California; 400 feet south and 4,200 feet east of the northwest corner of section 13, T. 5 S., R. 6 E., 37 degrees 30 minutes 23 seconds north latitude, 121 degrees 15 minutes 11 seconds west longtitude, Solyo 7.5 minute quadrangle.

Range in Characteristics

Depth to soft sandstone ranges from 20 to 40 inches.

The A horizon is 10YR 5/2, 5/3, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. Moist color is 10YR 4/2 or 5/3 or 2.5Y 4/2 or 5/2. Reaction is neutral to moderately alkaline.

The Bss or Bssk horizon is 10YR 5/2, 5/3, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. Moist color is 10YR 4/2, 4/3, or 5/3 or 2.5Y 4/2, 4/4, or 5/4. Texture is clay or silty clay. Effervescence is slight to moderate. The calcium carbonate equivalent ranges from 1.0 to 3.0 percent.

The exchangeable sodium percentage is 15 to 25, and electrical conductivity is 4 to 16 mmhos/cm.. Reaction is slightly alkaline to strongly alkaline.

Veritas Series

The Veritas series consists of moderately well drained soils on low fan terraces. These soils are deep to a hardpan. They formed in alluvium from mixed rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Typic Haploxerolls

Typical Pedon

Veritas sandy loam, 0 to 2 percent slopes, rarely flooded

Ap—0 to 10 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and common fine roots; few very fine interstitial pores; slightly alkaline (pH 7.4); clear smooth boundary.

A—10 to 21 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium angular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial pores; slightly alkaline (pH 7.4); clear smooth boundary.

Bw—21 to 33 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium angular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine roots; many very fine interstitial pores; few medium distinct yellowish brown (10YR 5/4) and dark yellowish brown (10YR 3/4) masses of iron accumulations moist; slightly effervescent; slightly alkaline (pH 7.7); gradual smooth boundary.

Bk—33 to 41 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine tubular pores; few medium distinct yellowish brown (10YR 5/4) and dark yellowish brown (10YR 3/4) masses of iron accumulations moist; strongly effervescent with segregations of carbonates in few medium soft masses and disseminated carbonates; slightly alkaline (pH 7.8); abrupt wavy boundary.

2Bkqm—41 to 60 inches; light gray (10YR 7/2) weakly to strongly cemented hardpan, brown (10YR 5/3) moist; many fine distinct dark brown (10YR 3/3) and yellowish brown (10YR 5/4) masses of iron accumulations, moist; massive; brittle; no roots observed; few fine tubular pores; 70 to 80 percent silica cementation within the matrix; strongly effervescent; strongly alkaline (pH 8.8).

Typical pedon location: Stanislaus County, California; 37 degrees 35 minutes 43 seconds north latitude, 121 degrees 11 minutes 13 seconds west longtitude (in an unsectioned area), Westley 7.5 minute quadrangle.

Range in Characteristics

Depth to a hardpan is 40 to 60 inches. Distinct or prominent iron accumulations are at a depth of 30 to 40 inches. Gravel content is 0 to 5 percent.

The A horizon is 10YR 4/2, 5/1, 5/2, or 5/3. Moist color is 10YR 3/1, 3/2, or 3/3. Reaction is slightly alkaline or moderately alkaline. Some pedons have an overwash of silty clay loam 15 to 19 inches thick.

The Bw and Bk horizons are 10YR 5/1, 5/3, 5/4, 6/2, 6/3, or 6/4 or 2.5Y 6/2. Moist color is 10YR 4/1, 4/2, 4/3, or 5/3 or 2.5Y 4/2 or 4/4. Texture is fine sandy loam or sandy loam. Reaction is slightly alkaline or moderately alkaline.

The 2Bkqm horizon is a hardpan that is strongly cemented to indurated in the laminar capping and weakly to strongly cemented in the underlying material. The silica cementation within the matrix of this horizon is 50 to 90 percent.

Vernalis Series

The Vernalis series consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium from mixed rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Calcic Haploxerepts

Typical Pedon

Vernalis clay loam, 0 to 2 percent slopes

Ap—0 to 10 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many medium and very fine roots; many medium and very fine tubular and interstitial pores; neutral (pH 6.8); clear smooth boundary.

A—10 to 20 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots;

many medium and very fine tubular and interstitial pores; neutral (pH 7.0); clear smooth boundary.

Bt—20 to 34 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; many very fine roots; many medium and very fine tubular pores; common thin clay films lining pores; lower part slightly effervescent with disseminated carbonates; slightly alkaline (pH 7.6); clear smooth boundary.

Btk1—34 to 46 inches; yellowish brown (10YR 5/4) clay loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many medium and very fine tubular pores; common thin clay films lining pores; slightly effervescent with disseminated carbonates and occasional segregations of carbonates in common fine seams; moderately alkaline (pH 8.0); gradual wavy boundary.

Btk2—46 to 62 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; many medium and very fine tubular pores; few thin clay films lining pores; strongly effervescent with disseminated carbonates and in common fine seams; moderately alkaline (pH 8.2).

Typical pedon location: Stanislaus County, California; 100 feet south and 1,055 feet west of the northeast corner of section 7, T. 6 S., R. 8 E., 37 degrees 26 minutes 06 seconds north latitude, 121 degrees 07 minutes 24 seconds west longtitude, Crows Landing 7.5 minute quadrangle.

Range in Characteristics

Gravel content is 0 to 5 percent.

The A horizon is 10YR 5/2, 5/3, 6/2, or 6/3. Moist color is 10YR 3/2, 3/3, 4/2, or 4/3. Texture is loam or clay loam. Reaction is neutral to moderately alkaline.

The Bt and Btk horizons are 10YR 4/3, 5/3, 5/4, 6/3, or 6/4. Moist color is 10YR 4/3, 4/4, 5/3, or 5/4. Texture is clay loam, loam, or silt loam. Reaction is neutral to moderately alkaline.

Wisflat Series

The Wisflat series consists of shallow, well drained soils on mountains. These soils formed in material weathered from sandstone. Slope ranges from 8 to 75 percent.

Taxonomic class: Loamy, mixed, superactive, calcareous, thermic Lithic Xerorthents

Typical Pedon

Wisflat sandy loam, in an area of Wisflat-rock outcrop complex, 50 to 75 percent slopes

A—0 to 5 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, friable, nonsticky and nonplastic; common very fine and few fine roots; few very fine tubular and interstitial pores; 5 percent gravel; slightly alkaline (pH 7.4); clear wavy boundary.

C—5 to 10 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, friable, nonsticky and nonplastic; common very fine and few fine roots; few very fine tubular and interstitial pores; strongly effervescent; 10 percent graavel; slightly alkaline (pH 7.4); abrupt wavy boundary.

Cr—10 to 13 inches; strongly weathered and fractured sandstone.

R—13 inches; slightly weathered sandstone.

Typical pedon location: Stanislaus County, California; 2,300 feet north and 1,100 feet west of the southeast corner of section 14, T. 5 S., R. 6 E., 37 degrees 29 minutes 59 seconds north latitude, 121 degrees 16 minutes 17 seconds west longtitude, Copper Mountain 7.5 minute quadrangle.

Range in Characteristics

Depth to hard sandstone is 10 to 20 inches. The soils have wide variations in depth within short distances.

The A horizon is 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4. Moist color is 10YR 4/2, 4/3, or 4/4. Content of gravel is 5 to 10 percent. Reaction is slightly alkaline or moderately alkaline.

The C horizon is 10YR 5/3, 6/3, 6/4, 7/2, 7/3, or 7/4. Moist color is 10YR 4/4, 5/3, or 5/4 or 2.5Y 4/4 or 5/4. Reaction is slightly alkaline or moderately alkaline. Texture is sandy loam, loam, or gravelly sandy loam with 5 to 25 percent angular gravel and cobbles.

Woo Series

The Woo series consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium domimantly from sedimentary rock. Slope ranges from 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Calcic Haploxerolls

Typical Pedon

Woo clay loam, in an area of Carranza-Woo complex, 0 to 2 percent slopes

Ap—0 to 8 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few fine tubular pores; slightly effervescent with disseminated carbonates; moderately alkaline (pH 8.0); abrupt smooth boundary.

Ak—8 to 19 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; slightly effervescent with disseminated and few very fine masses of carbonates; moderately alkaline (pH 8.0); clear smooth boundary.

Ck1—19 to 41 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, sticky and plastic; no roots; few very fine, fine, and medium tubular pores; strongly effervescent with disseminated carbonates with few fine threads and masses; moderately alkaline (pH 8.0); clear wavy boundary.

Ck2—41 to 60 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and medium tubular pores; strongly effervescent with disseminated carbonates and segregated as few fine threads and soft masses; moderately alkaline (pH 8.0).

Typical pedon location: Stanislaus County, California; 550 feet south and 1,400 feet east of the northwest corner of section 25, T. 6 S., R. 7 E., 37 degrees 23 minutes 27 seconds north latitude, 121 degrees 09 minutes 04 seconds west longtitude, Patterson 7.5 minute quadrangle.

Range in Characteristics

The A horizon is 10YR 5/2, 5/3, or 5/4. Moist color is 10YR 3/2 or 3/3. Reaction is slightly alkaline or moderately alkaline.

The C horizon is 10YR 5/4, 6/3, or 6/4. Moist color is 10YR 3/2, 3/3, 3/4, or 4/4. Reaction is slightly alkaline or moderately alkaline with strongly to violently effervescent carbonates that are disseminated or are segregated in fine threads or masses.

Yokut Series

The Yokut series consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium from mixed rock sources. Slope ranges from 0 to 2 percent.

Taxonomic class: Loamy-skeletal, mixed, superactive, thermic Typic Haploxeralfs

Typical Pedon

Yokut sandy loam, 0 to 2 percent slopes

Ap—0 to 11 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and few very fine roots; common very fine tubular pores; 5 percent gravel 5 to 20 mm in size; slightly acid (pH 6.2); clear smooth boundary.

A—11 to 19 inches; brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and plastic; common fine and very fine roots; few very fine tubular pores; 5 percent gravel 10 to 25 mm in size; slightly acid (pH 6.5); abrupt smooth boundary.

2Bt1—19 to 32 inches; brown (7.5YR 4/4) extremely gravelly sandy clay loam, brown (7.5YR 4/4) moist; massive; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; common thick clay films in pores; 70 percent gravel 10 to 25 mm in size; slightly alkaline (pH 7.4); gradual smooth boundary.

2Bt2—32 to 43 inches; brown (7.5YR 4/4) extremely gravelly sandy clay loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, sticky and plastic; few very fine interstitial pores; many moderately thick and thick clay films bridging sand grains and coating gravel; 70 percent gravel 10 to 25 mm in size; slightly alkaline (pH 7.4); clear smooth boundary.

2Bt3—43 to 60 inches; strong brown (7.5YR 5/6) very gravelly sandy clay loam, strong brown (7.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine interstitial pores; common moderately thick clay films bridging sand grains and coating gravel; 50 percent gravel 10 to 75 mm in size; 10 percent cobbles 75 to 150 mm in size; slightly alkaline (pH 7.6).

Typical pedon location: Stanislaus County, California; 800 feet south and 2,500 feet west of the

northeast corner of section 2, T. 8 S., R. 8 E., 37 degrees 16 minutes 23 seconds north latitude, 121 degrees 03 minutes 25 seconds west longtitude, Newman 7.5 minute quadrangle.

Range in Characteristics

The content of rock fragments ranges from 0 to 10 percent in the A horizon and from 50 to 80 percent in the 2Bt horizon.

The Ap and A horizons are 7.5YR 4/2, 4/4, or 5/6 or 10YR 4/2, 4/3, 5/4, 6/3, or 6/4. Moist color is 7.5YR 3/2 or 3/4 or 10YR 3/2, 3/3, 3/4, 4/3, or 4/4. Reaction is moderately acid to neutral. Texture is sandy loam or loam in the upper part and loam or sandy clay loam in the lower part.

The 2Bt horizon is 7.5YR 4/2, 4/4, 5/4, 5/6, or 6/4 or 10YR 4/3, 4/4, 5/2, 5/4, or 6/4. Moist color is 7.5YR 3/2, 3/4, 4/4, 4/6, 5/4, or 5/6 or 10YR 3/2, 3/3, 3/4, 4/3, or 4/4. Reaction is slightly alkaline or moderately alkaline. Texture is extremely gravelly loam, extremely gravelly sandy clay loam, very gravelly loam, or very gravelly sandy clay loam.

Zacharias Series

The Zacharias series consists of very deep, well drained soils on alluvial fans and low stream terraces. These soils formed in alluvium from mixed rock sources. Slope ranges from 0 to 5 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Typic Haoloxerepts

Typical Pedon

Zacharias clay loam,wet, 0 to 2 percent slopes

Ap—0 to 7 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; very hard, firm, sticky and plastic; few very, fine and medium roots; few fine tubular and few fine and medium interstitial pores; neutral (pH 6.9); clear smooth boundary.

A—7 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine, fine and medium roots; few fine tubular and few fine and medium interstitial pores; neutral (pH 7.1); clear smooth boundary.

Bt1—14 to 29 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine, fine, medium and coarse roots; common very fine and fine tubular pores; few thin clay films on ped faces and lining pores; slightly alkaline (pH 7.5); gradual smooth boundary.

Bt2—29 to 39 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/6) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; common very fine tubular pores; common moderately thick clay films on ped faces and lining pores; slightly alkaline (pH 7.7); gradual smooth boundary.

Bt3—39 to 50 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/6) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and medium roots; common very fine tubular pores; few thin clay films on ped faces and lining pores; slightly alkaline (pH 7.8); gradual smooth boundary.

Bt4—50 to 66 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; common very fine tubular pores; few moderately thick clay films on ped faces and lining pores; few fine distinct masses of iron accumulations reddish brown (5YR 5/4) moist; slightly alkaline (pH 7.8).

Typical pedon location: Stanislaus County, California; 2,200 feet south and 400 feet east of the northwest corner of section 4, T. 6 S. R. 8 E., 37 degrees 26 minutes 37 seconds north latitude, 121 degrees 06 minutes 06 seconds west longtitude, Crows Landing 7.5 minute quadrangle.

Range in Characteristics

Gravel content is 0 to 35 percent.

The A horizon is 7.5YR 4/2, 4/3, or 5/2 or 10YR 4/2, 4/3, 5/2, 5/3, 5/4, or 6/3. Moist color is 7.5YR 3/2 or 4/4 or 10YR 3/2, 3/3, 4/2, or 4/3. Texture is clay loam or gravelly clay loam. Reaction is slightly acid or neutral.

The Bt or Bw horizon is 7.5YR 5/2, 5/4, or 5/6 or 10YR 4/3, 4/4, 5/2, 5/3, or 5/4. Moist color is 7.5YR 5/4 or 10YR 4/2, 4/3, 4/4, 4/6, or 5/4. Texture is loam, clay loam, gravelly loam, or gravelly clay loam. Reaction is neutral or slightly alkaline.

Formation of the Soils

Soil is a three-dimensional body covering the land surface and supporting plants. This covering has developed through natural processes. The processes that influence soil development are the result of an interaction of parent material, topography, time, climate, and living organisms (plants and animals). The interaction of these five soil-forming factors affects the formation of every soil. The relative effect varies from one soil to another and in many instances over short distances. Variations of soil depth and the internal properties from one place to another result from the interaction of these soil-forming factors. Humans have an increasing influence on soil development through activities that cause changes in the five soil-forming factors.

The area has a history dominated by faulting and uplifting of the Coast Range. Two major fault zones, the San Joaquin and the Ortigalita, have created the landscape in the area. The San Joaquin Fault is the dominant boundary between the forces of erosion of the terraces, foothills, and mountains to the west and the forces of deposition to the east. The Ortigalita Fault is the dominant boundary between the Franciscan Formation and the Panoche Formation.

In the paragraphs that follow a brief discussion is given relating the five soil-forming factors to the area. Most of the conclusions and comparisons are based on numerous field observations of the soils, vegetation, and parent material found throughout the area. These observations were then compared with laboratory data on specific soils.

Parent Material

Parent material is defined as the unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of soils is developed by pedogenic processes. Most of the parent material originated from the Coast Range.

Following mountain building (uplifting and folding), mechanical and chemical weathering of exposed bedrock produces a layer of loose broken rock material. On steep slopes, this material is intermittently moved downhill by gravity and water. It can be moved both very short distances, and long distances to the bottom of the slope or into a steep drainageway.

Parent Material of the Mountains and Foothills

The parent material of the mountains and foothills can be divided into three major groups. These groups are the calcareous influence of the Moreno and Panoche Formations; the noncalcareous influence of the Franciscan Formation of sandstone and shales; and the Franciscan Formation of the ultra mafic rocks.

Wisflat and Arburua soils dominate the Moreno and Panoche Formations. Both soils are strongly or violently effervescent to HCl throughout the profile. The typical profile of Wisflat is found on a western aspect and is shallow with no profile development. However, the typical profile of Arburua is found on a northern aspect and is moderately deep and has developed a cambic horizon with secondary soft masses of calcareous material.

Honker, Gaviota, and Gonzaga soils dominate the sandstones and shales of the Franciscan Formation. The typical profile of Honker is found on a southern aspect and is moderately deep with a thin dark colored surface and an argillic horizon over sandstone. The typical profile of Gaviota is also found on a southern aspect and is shallow with no profile development over sandstone. The typical profile of Gonzaga is found on a northwest aspect and is moderately deep with a dark surface horizon and an argillic horizon over shale.

Hentine and Henneke soils dominate the ultra mafic rocks or serpentine of the Franciscan Formation. Common characteristics of soils on this parent material is the imbalance of calcium and magnesium, magnesium toxicity, heavy metal toxicity, or low levels of essential nutrients. From the laboratory data run on selected soils in the area, the Ca-Mg ratio of soils influenced by serpentinitic rock ranged from 0.1 to 0.7, whereas the Ca-Mg ratio of the other soils ranged from 1.4 to 8.9. The higher ratio of these soils is more than likely a reflection of the parent material from the Panoche and/or Moreno Formations. Also, the extractable magnesium in the soils influenced by serpentinitic rock ranged from 16.6 to 42.7

millequivalents per 100 grams, and the extractable mangnesium in the other soils ranged from 4.9 to 12.1 millequivalents per 100 grams.

The typical profile of Hentine is found on a south-facing slope and is shallow with a dark surface and a loamy-skeletal argillic horizon over serpentinized peridotite. The typical profile of Henneke is found on a northeast-facing slope and is shallow with a dark surface and a clayey-skeletal argillic horizon over serpentine.

Parent Material of the Flood Plains, Interfan Basins, and Alluvial Fans

Three major alluvial deposits are recognized—alluvial fan deposits, San Luis Ranch alluvium, and Dos Palos alluvium. These alluvial deposits are a rough approximation of the soils of the survey area.

Topography

The topography influences soil development through its effect on drainage, runoff, and depth of penetration by soil moisture. The flood plains, interfan basins, alluvial fans, terraces, foothills, and, mountains occurring throughout the area each have a dominant relief. For example, Merritt and other soils on flood plains are nearly level and accumulate excess runoff and erosional material from higher landforms. These soils are poorly drained, formed in stratified alluvium, and have a thick, dark surface horizon.

In contrast are the soils on low or uplifted terraces. These soils are nearly level to rolling and accumulate minimal to no runoff and have a subsoil that has been stable enough to accumulate clays. A good example is Damluis soils. Thse soils are well drained; have a thick, dark surface layer; and have an argillic horizon.

Most of the mountains and foothills show a marked difference in soil development resulting from the aspect of the side slopes within a local area. This is reflected by a higher content of organic matter, thicker surface layer, or deeper soil depth. For example, Gonzaga soils, which are dominantly on north-facing slopes have a thicker and darker surface layer than Honker soils, which are dominantly on south-facing slopes.

Time

Soil development begins when the geologic material is exposed to weathering. Time combined with the erosional and leaching effect of precipitation has also influenced the development of soils. When differences in precipitation are added, the soils that develop can be completely different.

Climate

Soil development is influenced by the variation in temperature, moisture, and their seasonal distribution which varies with elevation and aspect. Generally, precipitation increases and soil temperature decreases with increasing elevation. Also, in the same area, the effective moisture and soil temperature on north-facing slopes will be more moist and cooler than those on south-facing slopes.

The complex topography of flood plains, interfan basins, alluvial fans, terraces, foothills, and mountains within the survey area influences the climate throughout the area. Three moisture regimes, xeric, aridic, and aquic, are recognized throughout the area. One temperature regime, thermic, is recognized.

Storms originate both from the southwest and northwest and move to the east. Therefore, the highest precipitation is in the west with about 18 inches of precipitation, and the lowest is in the east with about 10 inches of precipitation. As the storm moves to the east, the highest precipitation will be in the mountains and a rain-shadow area will be created in the valley.

Living Organisms

While the soil itself is not considered to be alive, its mineral and organic components are critical as a substrate for myriads of micro-organisms and macro-organisms. The effective moisture provided to these organisms has had the greatest influence on the past and present-day vegetation. The amount of precipitation combined with elevational and aspect changes has influenced the temperature and effective moisture.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvial plain. A flood plain or a low-gradient delta. It may be modern or relict.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 2.5
Low	2.5 to 5
Moderate	5 to 7.5
High	7.5 to 10
Very high	more than 10

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Basin. A depressed area with no or limited surface outlet. Examples are closed depressions in a glacial till plain, lake basin, river basin, or fault-bordered intermontane structure such as the Bighorn Basin of Wyoming.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte. An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded, or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity (CEC). The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane that typically takes the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Cuesta. A hill or ridge that has a gentle slope on one side and a steep slope on the other; specifically, an asymmetric, homoclinal ridge capped by resistant rock layers of slight or moderate dip.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Debris flow. (mudflow) A mass movement process involving rapid flow of highly viscous mixtures of debris, water, and entrapped air. Water content may range up to 60 percent. A mudflow is a type

of debris flow with clastic particles of sand size and finer.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic).—Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated).—Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fault. A fracture or fracture zone of the earth with displacement along one side in respect to the other.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special

equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Hill slope. The steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of the hill. In descending order, geomorphic components of a simple hill slope may include shoulder, back slope, foot slope, and toe slope. However, all of these components are not necessarily present in any given hill slope continuum. In addition, complex hill slopes may include two or more back slope to toe slope sequences.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hummock. A rounded or conical mound or knoll, hillock, or other small elevation. Also, a slight rise of ground above a level surface.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Hydrophyte. A plant that grows in water or in wet or saturated soils. See xerophyte, mesophyte.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as

contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Intake family. Each soil has its own intake characteristics. These intake characteristics have been grouped into eight groups and have been assigned intake family numbers. The surface texture determines the intake families. However, other soil properties, such as cracking, structure, bulk density, crusting, and amount and continuity of pores, should be considered (USDA, SCS, 1988). The intake family, in inches per hour, is expressed as follows:

C, SiC	0.1
SC, SiCL	0.3
CL, SCL, Si	0.5
SiL	0.7
L, VFSL	1.0
FSL, SL, CoSL, L	1.5
VFS, LS, LCoS, VFS, FS	3.0
S, CoS	4.0

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Meta basic. A basic igneous rock which shows evidence of having been subjected to metamorphism.

Meta igneous. An igneous rock which shows evidence of having been subjected to metamorphism.

Meta volcanic. A volcanic rock which shows evidence of having been subject to metamorphism.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Metamorphism. The mineralogical and structural adjustment of solid rocks to physical and chemical conditions which have been imposed at depth below the surface zones of weathering and cementation.

Metasediment. A sediment or sedimentary rock which shows evidence of having been subject to metamorphism.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mound. A low rounded hill of earth, natural or artificial.

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Mudflow. (Mass move) A general term for a mass-movement landform and a process characterized by a flowing mass of predominantly fine-grained earth material possessing a high degree of fluidity during movement. If more than half of the solid fraction of such a mass consists of material larger than sand size, the term debris flow is preferable.

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Mulch. A natural or artificial layer of plant residue or other materials, such as sand or paper, on the soil surface.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pediment. A gently sloping erosional surface developed at the foot of a receding hill or mountain slope, The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.00 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where

surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubbleland. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	More than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when

dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 5 percent
Moderately sloping	5 to 9 percent
Strongly sloping	9 to 15 percent
Moderately steep	15 to 30 percent
Steep	30 to 50 percent
Very steep	50 percent and higher

Classes for complex slopes are as follows:

Nearly level	0 to 2 percent
Undulating	2 to 5 percent
Gently rolling	5 to 9 percent
Rolling	9 to 15 percent
Hilly	15 to 30 percent
Steep	30 to 50 percent
Very steep	50 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slope alluvium. Sediment gradually transported on mountains or hill slopes primarily by alluvium processes and characterized by particle sorting. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of coarse fragments and may be separated by stone lines. Sorting of rounded or subrounded gravel or cobbles and burnished peds contrast with unsorted colluvial deposits.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of sodium to calcium plus magnesium. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging

between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stratified. Arranged in strata, or layers.The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Tailwater. The water directly downstream of a structure.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace. An embankment, or ridge, constructed

across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Water table, perched. The surface of a local zone of saturation held above the main body of ground water by an impermeable layer or stratum, generally clay, and separated from the main body of ground water by an unsaturated zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windbreak. A living barrier of trees or combination of trees and shrubs located adjacent to farm or ranch headquarters and designed to protect the area from cold or hot winds and drifting snow. Also headquarters and livestock windbreaks.

Windthrow. The uprooting and tipping over of trees by the wind.

Appendices

Appendix A is an excerpt from California supplement CA-4 to the National Conservation Planning Manual, dated February 1981, United States Department of Agriculture, Soil Conservation Service.

Appendix B includes guides for assigning land capability classes, subclasses, and units. The original documentation is a California supplement dated November 1969. Any revisions are noted in the appendix.

Appendix C is an edited version of the ratings guides described in the National Soil Survey Handbook, Part 620, dated November 1993, United States Department of Agriculture, Soil Conservation Service. These guides provided the basis for the interpretive ratings given in the tables Recreational development, Building site development, Sanitary facilities, Construction materials, and Water management. Soils are rated for the uses expected to be important or potentially important to users of soil survey information. Ratings for proposed uses are given in terms of limitations and restrictive features. Only the most restrictive features are listed in the tables. Therefore, if a soil is rated severe, only those soil features that cause the soil to be rated severe are given. There may be other limitations that should be overcome if the soil is to be used for a specific purpose. The guides in appendix C show in the first column the properties or features used as criteria for rating the soil for the use. The properties are listed in descending order of estimated importance. In the "Limits" column, limits of the properties are given for rating the soils and for recognizing a restrictive property or properties. In the "Restrictive feature" column, a key phrase indicates the feature causing the problem.

Appendix A.—Prime Farmlands—California

Prime farmland is land best suited for producing food, forage, fiber, and oilseed crops and also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land but not urban buildup land or water). It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

Prime farmland meets all of the following criteria:

1. The soils have:
   a. Aquic, udic, ustic, or xeric moisture regimes and an available water capacity of at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil to produce the commonly grown cultivated crops (cultivated crops include, but are not limited to, grain, forage, fiber, oilseed, sugarbeets, vegetables, orchard, vineyard, and bush fruit crops) adapted to the region in 7 or more years out of 10; or
   b. Xeric, ustic, aridic, or torric moisture regimes in which the available water capacity is at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil and the area has a developed irrigation water supply that is dependable (a dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years for the crops commonly grown) and of adequate quality; and,
2. The soils have a temperature regime that is frigid, mesic, thermic, or hyperthermic (pergelic and cryic regimes are excluded). These are soils that, at a depth of 20 inches (50 cm), have a mean annual temperature higher than 32 degrees F (0 degrees C). In addition, the mean summer temperature at this depth in soils with an O horizon is higher than 47 degrees F (8 degrees C); in soils that have no O horizon, the mean summer temperature is higher than 59 degrees F (15 degrees C); and,
3. The soils have a pH between 4.5 and 8.4 in all horizons within a depth of 40 inches (1 meter); and,
4. The soils either have no water table or have a water table that is maintained at a sufficient depth during the cropping season to allow cultivated crops common to the area to be grown; and,
5. The soils can be managed so that, in all horizons within a depth of 40 inches (1 meter), during part of each year the conductivity of the saturation extract is less than 4 mmhos/cm and the exchangeable sodium percentage (ESP) is less than 15; and,
6. The soils are not flooded frequently during the growing season (less often than once in 2 years); and,
7. The product of K (erodibility factor) x percent slope is less than 2.0; and,
8. The soils have a permeability rate of at least 0.06 inch (0.15 cm) per hour in the upper 20 inches (50 cm) and the mean annual soil temperature at a depth of 20 inches (50 cm) is less than 59 degrees F (15 degrees C); the permeability rate is not a limiting factor if the mean annual soil temperature is 59 degrees F (15 degrees C) or higher; and,
9. Less than 10 percent of the surface layer [upper 6 inches (15 cm)] in these soils consists of rock fragments coarser than 3 inches (7.6 cm); and,
10. The soils have a minimum rooting depth of 40 inches (1 meter).

The national Land Inventory Monitoring (LIM) definitions have been slightly modified for California standards: criterion 1 is a California definition, not a national one. Part A which reads “AWC of at least 4 inches (10 cm), per 40 to 60 inches (1 to 1.52 meters) of soil” is a California definition.

Appendix B.—Guide for Placing Soils in Capability Classes

Criteria	Capability class 1	2	3	4	5	6 [12]	7 [13]	8 [14]
Effective soil depth (in) [1]	≥40	≥40	>20	≥10	≥20	≥10	Any	Any
ETp 32 degrees F	≥20	≥14	≥10	≥6	≥6	>4	---	Any
4ETa	≥20	≥16	≥12	≥8	≥8	≥6	>2	Any
Surface texture (irrigated)	SL-CL	LS-C, may be GR	Any, may be GR, CB	Any, may be GRV, CBV, ST [10]	Any, may be GRX, CBX, STV	Any, may be GRX, CBX, STV	Any	Any
Surface texture (nonirrigated)	SL-CL	SL-C, may be GR	SL-C, may be, GR, CB	LS-C, GRV, CBV, ST [10]	Any, may be GRX, CBX, STV	Any, may be GRX, CBX, STV	Any	Any
Permeability (in/hr) [2]	0.2-6.0	0.06-20	<0.06-20	Any	Any	Any	Any	Any
Depth to water table (in) [3]	Well or mod. well >60	Somewhat poorly through Somewhat excessively >36	Poorly through Excessively >20	Poorly through Excessively >20	Any	Any	Any	Any
Available water capacity (in) [9]	≥7.5 avg. AWC >0.13 in/in	≥5.0 avg. AWC ≥0.08 in/in	>3.5 avg. AWC ≥0.06 in/in	≥2.5 avg. AWC >0.04 in/in	>3.0 avg. AWC	≥2.0 avg. AWC	≥1.0 avg. AWC	Any
Slope (%): [5, 6, 7]								
Group A	<2	<5	<8	<15	<2	<25	<50	Any
Group B	<2	<8	<15	<25	<2	<50	<75	Any
Erosion hazard	None or slight	None through moderate	None through high	Any	None or slight	Any	Any	Any
Flooding	None or rare	None through occasional	None through occasional	None through frequent [11]	Any	Any	Any	Any
Salinity/EC x 10 at 25 °C (mmhos/cm) [8]	<4	<8	<16	<16	<8	Dryland, <16 Irrigated, any	Any	Any
Alkali ESP [8]	None	<25	<50	<50	<25	Dryland, <25 Irrigated, <50	Any	Any

Guide for Placing Soils in Capability Classes—Continued

Criteria	Capability class							
	1	2	3	4	5	6[12]	7[13]	8[14]
Toxic substances[9]	None	None or slight	None through moderate	None through moderate	None or slight	Dryland, slight Irrigated, slight through moderate	Any	Any
Frost-free season (32 degrees F)	≥140 days	≥100 days	≥80 days	≥50 days	Any	Any	Any	Any

[1] Claypans with permeability of less than 0.06 inch/hour will be treated as limiting the effective depth.
[2] Permeability of the least permeable subsurface horizon.
[3] Depth to the water table during the growing season.
[4] Available moisture between field capacity and wilting point.
[5] Use erosion hazard to help determine upper slope percent.
[6] In existing mapping units 9 percent and 30 percent can be substituted for 8 percent and 25 percent.
[7] Column A includes soils with K factors of 0.37 or more and soils that are subject to rill and gully erosion, such as soils that formed in granitic material and soils that have a claypan. Other soils are in group B.
[8] For salts and alkali to be a major limitation, there should be other soil limitations, such as slow permeabiliti or high water tables.
[9] Such as boron and magnesium, which are leached with difficulty.
[10] Coarse fragments interfere with tillage but do not prevent cropping.
[11] Frequent flooding that does not prevent normal cropping.
[12] Range and woodland mechanical practices can be applied to class VI land.
[13] Range and woodland mechanical practices are impractical on class VII land.
[14] Class 8 land have limitations that preclued their use for commercial plant production and restrict their use to recreation, water supply, or esthetic purposes.

Guide for Placing Soils in Capability Subclasses in California—A

(Where wind velocities are low and/or soils are irrigated. Only soils in capability classes 2 through 8 are assigned to a subclass.)

Soil properties	Subclass by slope range [1]			
	0-2%	2-9%	9-15%	15+%
1. Moderately slowly, moderately, moderately rapidly, rapidly, and very rapidly permeable, moderately well drained, well drained, somewhat excessively drained, and excessively drained soils more than 20 inches deep that have the following textures:				
a. Fine and very fine	s	e	e	e
b. Moderately fine	s[2, 3]	e	e	e
c. Medium	s[2, 3]	e	e	e
d. Moderately coarse, with or without a textural B	s[2, 3]	e	e	e
e. Coarse and very coarse, with a textural B	s	e	e	e
f. Coarse and very coarse, with little or no textural B	s	s	s	e
2. Slowly and very slowly permeable soils that are more than 20 inches deep:[4]				
a. Well drained and moderately well drained	s	e	e	e
b. Somewhat poorly drained	w	e	e	e
3. Wet, poorly drained and very poorly drained soils:				
a. Moderately coarse to fine textured (includes claypans and fragipans)	w	w	w	e
b. Coarse textured with little or no textural B[5]	w	w	w	e
c. Deep organic soils[5]	w	w	w	e
4. Excessively drained, somewhat excessively drained, and moderately well drained, shallow and very shallow soils:				
a. 10 to 20 inches deep to bedrock	s	e	e	e
b. 0 to 10 inches deep to bedrock	s	s	s	s[5]

Guide for Placing Soils in Capability Subclasses—A (Continued)

Soil properties	Subclass by slope range			
	0-2%	2-9%	9-15%	15+%
5. Excessively drained, somewhat excessively drained, well drained, and moderately well drained, saline and sodic soils (moderate to severe salinity and sodicity)	s	e	e	e
6. Soils that have a very cobbly, extremely cobbly, very gravelly, extremely gravelly, very stony, or extremely stony surface layer	s	s	s	s[6]
7. Soils that are subject to damaging overflow	w	w	w	e

[1] For soils in capability classes 2 and 3. Class 1 land is excluded.
[2] Where these soils are more than 40 inches deep, they are generally in class 1.
[3] Use "C" only for dryland if soil is class 1 irrigated.
[4] Permeability of the B horizon or control section.
[5] Including somewhat poorly drained soils.
[6] Subclass "e" if slope is more than 50 percent.
[7] Subclass "e" if slope is more than 30 percent.

Guide for Placing Soils in Capability Subclasses in California—B

(Where wind velocities are high and the soils are not irrigated. Only soils in capability classes 2 through 8 are assigned to a subclass.)

Soil properties	Subclass by slope range[1]			
	0-2%	2-9%	9-15%	15+%
1. Moderately slowly, moderately, moderately rapidly, rapidly, and very rapidly permeable, moderately well drained, well drained, somewhat excessively drained, and excessively drained soils more than 20 inches deep that have the following textures:				
a. Fine and very fine	s	e	e	e
b. Moderately fine	e	e	e	e
c. Medium	e	e	e	e
d. Moderately coarse, with or without a textural B	e	e	e	e
e. Coarse and very coarse, with a textural B	e	e	e	e
f. Coarse and very coarse, with little or no textural B	e	e	e	e
2. Slowly and very slowly permeable soils that are more than 20 inches deep:[4]				
a. Well drained and moderately well drained	s	e	e	e
b. Somewhat poorly drained	w	e	e	e
3. Wet, poorly drained and very poorly drained soils:				
a. Moderately coarse to fine textured (includes claypans and fragipans)	w	w	w	e
b. Coarse textured with little or no textural B[5]	w	w	w	e
c. Deep organic soils[5]	w	w	w	e
4. Excessively drained, somewhat excessively drained, and moderately well drained, shallow and very shallow soils:				
a. 10 to 20 inches deep to bedrock	s	s	e	e
b. 0 to 10 inches deep to bedrock	s	s	s	s[6]

Guide for Placing Soils in Capability Subclasses—B (Continued)

Soil properties	Subclass by slope range			
	0-2%	2-9%	9-15%	15+%
5. Excessively drained, somewhat excessively drained, well drained, and moderately well drained, saline and sodic soils (moderate to severe salinity and sodicity)	s	e	e	e
6. Soils that have a very cobbly, extremely cobbly, very gravelly, extremely gravelly, very stony, or extremely stony surface layer	s	s	s	s[7]
7. Soils that are subject to damaging overflow	w	w	w	e

[1] For soils in capability classes 2 through 8. Class 1 land is excluded.
[2] Where these soils are more than 40 inches deep, they are generally in class I.
[3] Use "C" only for dryland if soil is class 1 irrigated.
[4] Permeability of the B horizon or control section.
[5] Including somewhat poorly drained soils.
[6] Subclass "e" if slope is more than 50 percent.
[7] Subclass "e" if slope is more than 30 percent.

Guide for Placing Soils in Capability Units

Capability Unit	Principal Soil Property or Limitation
1	Potential or actual wind or water erosion hazard.
2	Drainage or overflow hazard (somewhat or poorly drained, flooded or ponded).
3	Slowly or very permeable subsoils or substrata.
4	Coarse or gravelly textures.
5	Fine or very fine textures.
6	Salinity or alkali, sufficient to constitue a continuing limitation or hazard.
7	Stones, cobbles, or rocks sufficient to interfere with tillage.
8	Hardpan or hard unweathered bedrock within the root zone.
9	Low inherent fertility, associated with strong acidity, low calcium-magnesium ratio, or excess calcium, boron, or molydenum.
10	High organic matter content—peats and mucks.
11	Coarse sandy or very gravelly substrata limiting to root penetration and moisture retention.

Appendix C.—Criteria Used in Rating Soils for Selected Uses

The following tables show the criteria used in rating soils for selected uses in tables 11, 12, 13, 14, and 15 in this survey. Soils are rated for the uses expected to be important or potentially important to users of soil survey information. Ratings for proposed uses are given in terms of limitations and restrictive features. Only the most restrictive features are listed in the tables. Therefore, if a soil is rated severe, only those soil features that cause the soil to be rated severe are given. There may be other limitations that should be overcome if the soil is to be used for a specific purpose.

The first column in the guides in this appendix shows the properties or features used as criteria for rating the soil for the use. The properties are listed in descending order of estimated importance. In the “Limits” column, limits of the properties are given for rating the soils and for recognizing a restrictive property or properties. In the “Restrictive feature” column, a key phrase indicates the feature causing the problem.

Camp Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	---	Rare, common	Flooding.
3. Slope (percent)	<8	8-15	>15	Slope.
4. USDA texture modifier (surface layer)	---	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	Large stones.
5. Coarse fragments in the surface layer (percent) [1]	<25	25-50	>50	Small stones.
6. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.5-2.5	<1.5	Wetness.
7. Permeability in the upper 40 inches (in/hr) [2]	>0.6	0.06-0.6	<0.06	Percs slowly.
8. USDA texture (surface layer) [2]	---	---	SC, SIC, C	Too clayey.
9. Unified (surface layer)	---	---	PT	Excess humus.
10. USDA texture (surface layer)	---	LCOS, VFS, [3] LFS, [3] LS	COS, S, FS	Too sandy.
11. Depth to bedrock (inches)	---	---	<20	Depth to rock.
12. Depth to cemented pan (inches)	---	---	<20	Cemented pan.
13. USDA texture (surface layer) [4]	---	SIL, SI, VFSL, L	---	Dusty.
14. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
15. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
16. Soil reaction (pH in the surface layer)	---	---	<3.6	Too acid.
17. Other	---	---	(5)	Fragile.

[1] 100 minus percent passing No. 10 sieve.
[2] Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.
[3] Rate *slight* if finer textured material is within 20 inches of the surface.
[4] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[5] If the soil is easily damaged by use or disturbance, rate *severe—fragile.*

Picnic Areas

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Slope (percent)	<8	8-15	>15	Slope.
3. Flooding	None, rare, occasional	Frequent	---	Flooding.
4. Depth to high water table (feet)	--- >2.5	--- 1.0-2.5	+ <1.0	Ponding. Wetness.
5. USDA texture modifier (surface layer)	---	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	Large stones.
6. USDA texture (surface layer) [1]	---	---	SC, SIC, C	Too clayey.
7. USDA texture (surface layer)	---	LCOS, VFS,[2] LFS, [2] LS	COS, S, FS	Too sandy.
8. Unified (surface layer)	---	---	PT	Excess humus.
9. Coarse fragments in the surface layer (percent) [3]	<25	25-50	>50	Small stones.
10. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
11. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
12. Soil reaction (pH) in the surface layer	---	---	<3.6	Too acid.
13. Permeability in the upper 40 inches (in/hr) [1]	>0.6	0.06-0.6	<0.06	Percs slowly.
14. USDA texture (surface layer) [4]	---	SIL, SI, VFSL, L	---	Dusty.
15. Depth to bedrock (inches)	---	---	<20	Depth to rock.
16. Depth to cemented pan (inches)	---	---	<20	Cemented pan.
17. Other	---	---	(5)	Fragile.

[1] Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.
[2] Rate *slight* if finer textured material is within 20 inches of the surface.
[3] 100 minus percent passing No. 10 sieve.
[4] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[5] If the soil is easily damaged by use or disturbance, rate *severe—fragile.*

Playgrounds

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. USDA texture modifier (surface layer)	---	ST	STV, STX, BYV, BYX, CB, CBV, FL, FLV, BY, CBX, CNX, CRX, FLX, SHX, SYX	Large stones.
3. Slope (percent)	<2	2-6	>6	Slope.
4. Coarse fragments in the surface layer (percent) [1]	<10	10-25	>25	Small stones.
5. USDA texture (surface layer) [2]	---	---	SC, SIC, C	Too clayey.
6. USDA texture (surface layer)	---	LCOS, VFS, [3] LFS, [3] LS	COS, S, FS	Too sandy.
7. Unified (surface layer)	---	---	PT	Excess humus.
8. Depth to high water table (feet)	--- >2.5	--- 1.5-2.5	+ <1.5	Ponding. Wetness.
9. Flooding	None, rare	Occasional	Frequent	Flooding.
10. Depth to bedrock (inches)	>40	[4] 20-40	<20	Depth to rock.
11. Depth to cemented pan (inches)	>40	[4] 20-40	<20	Cemented pan.
12. Permeability in the upper 40 inches (in/hr) [2]	>0.6	0.06-0.6	<0.06	Percs slowly.
13. USDA texture (surface layer) [5]	---	SIL, SI, VFSL, L	---	Dusty.
14. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
15. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
16. Soil reaction (pH) in the surface layer	---	---	<3.6	Too acid.
17. Other	---	---	[6]	Fragile.

[1] 100 minus percent passing No. 10 sieve.
[2] Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.
[3] Rate *slight* if finer textured material is within 20 inches of the surface.
[4] Rate *slight* if slopes are 0 to 2 percent.
[5] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[6] If the soil is easily damaged by use or disturbance, rate *severe—fragile.*

Paths and Trails

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Fraction greater than 3 inches in the surface layer (percent by weight)	<25	25-50	>50	Large stones.
3. Depth to high water table (feet)	---	---	+	Ponding.
	>2	1-2	<1	Wetness.
4. USDA texture (surface layer) [1]	---	---	SC, SIC, C	Too clayey.
5. USDA texture (surface layer)	---	LCOS, VFS, [2] LFS, [2] LS	COS, S, FS	Too sandy.
6. Unified (surface layer)	---	---	PT	Excess humus.
7. Slope (percent)	<15	15-25	>25	Slope.
8. Erosion factor K (surface layer)	---	---	[3] >.3	Erodes easily.
9. Coarse fragments in the surface layer (percent by weight) [4]	---	---	>65	Small stones.
10. Flooding	None, rare, occasional	Frequent	---	Flooding.
11. USDA texture (surface layer) [5]	---	SIL, SI, VFSL, L	---	Dusty.
12. Other	---	---	(6)	Fragile.

[1] Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.
[2] Rate *slight* if finer textured material is within 20 inches of the surface.
[3] Disregard if slopes are 8 percent or less.
[4] 100 minus percent passing No. 10 sieve.
[5] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[6] If the soil is easily damaged by use or disturbance, rate *severe—fragile*.

Septic Tank Absorption Fields

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>24	Subsides.
3. Flooding	None	Rare	Common	Flooding.
4. Depth to bedrock (inches)	>72	40-72	<40	Depth to rock.
5. Depth to cemented pan (inches)	>72	40-72	<40	Cemented pan.
6. Depth to high water table (feet)	---	---	+	Ponding.
	>6	4-6	<4	Wetness.
7. Permeability (in/hr):				
24 to 60 inches	2.0-6.0	[1] 0.6-2.0	<0.6	Percs slowly.
24 to 40 inches	---	---	>6.0	Poor filter.
8. Slope (percent)	<8	8-15	>15	Slope.
9. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
10. Downslope movement	---	---	(3)	Slippage.
11. Formation of pits	---	---	(4)	Pitting.

[1] Recheck to see if rating should be *slight*.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.
[4] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting*.

Sewage Lagoons

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Permeability between 12 and 60 inches (in/hr)	<0.6	0.6-2.0	>2.0	Seepage.
3. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
4. Depth to cemented pan	>60	40-60	<40	Cemented pan.
5. Flooding	None, rare	---	Common [1]	Flooding.
6. Slope (percent)	<2	2-7	>7	Slope.
7. Unified (any depth)	---	OL, OH	PT	Excess humus.
8. Depth to high water table (feet)	--- >5	--- [2] 3.5-5	+ [2] <3.5	Ponding. Wetness.
9. Fraction greater than 3 inches (percent by weight) [3]	<20	20-35	>35	Large stones.
10. Downslope movement	---	---	(4)	Slippage.
11. Formation of pits	---	---	(5)	Pitting.
12. Differential settling	---	---	(6)	Unstable fill.

[1] If floodwater will not enter or damage the sewage lagoon because of low velocity and a water depth of less than 5 feet, disregard flooding.
[2] If the floor of the sewage lagoon has a layer at least 20 inches thick with permeability of less than 0.2 in/hr, disregard wetness.
[3] Weighted average to 20 inches.
[4] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.
[5] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting*.
[6] If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Sanitary Landfill (Trench)

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	Rare	Common	Flooding.
3. Depth to bedrock (inches)	---	---	<72	Depth to rock.
4. Depth to cemented pan (inches):				
Thick	---	---	<72	Cemented pan.
Thin	---	<72	---	Cemented pan.
5. Permeability of bottom layer (in/hr) [1]	---	---	>2.0	Seepage.
6. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	---	---	<6	Wetness.
Perched	>4	2-4	<2	Wetness.
7. Slope (percent)	<8	8-15	>15	Slope.
8. USDA texture [1 2 3]	---	CL, SC, SICL	SIC, C	Too clayey.
9. USDA texture [3]	---	LCOS, LS, LFS, LVFS	COS, S, FS, VFS, SG	Too sandy.
10. Unified [3]	---	---	OL, OH, PT	Excess humus.
11. Fraction greater than 3 inches (percent by weight) [4]	<20	20-35	>35	Large stones.
12. Sodium adsorption ratio in the upper 40 inches or great group or phase [1]	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
13. Soil reaction (pH) at any depth	---	---	<3.6	Too acid.
14. Salinity at any depth (mmhos/cm)	---	---	>16	Excess salt.
15. Downslope movement	---	---	(5)	Slippage.
16. Differential settling	---	---	(6)	Unstable fill.

[1] Disregard in all Aridisols except Salorthids and Aquic subgroups, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic subgroups.
[2] Rate one class better if the soil is in kaolinitic family and experience confirms.
[3] Thickest layer between 10 and 60 inches.
[4] Weighted average to 60 inches.
[5] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.
[6] If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Sanitary Landfill (Area)

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	Rare	Common	Flooding.
3. Depth to bedrock (inches) [1]	>60	40-60	<40	Depth to rock.
4. Depth to cemented pan (inches) [1]	>60	40-60	<40	Cemented pan.
5. Permeability between 20 and 40 inches (in/hr) [1]	---	---	>2.0	Seepage.
6. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	>5	3.5-5	<3.5	Wetness.
Perched	>3	1.5-3	<1.5	Wetness.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Downslope movement	---	---	(2)	Slippage.
9. Formation of pits	---	---	(3)	Pitting.
10. Differential settling	---	---	(4)	Unstable fill.

[1] Disregard in all Aridisols except Salorthids and Aquic subgroups, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic subgroups.

[2] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*

[3] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting.*

[4] If the soil is susceptible to differential settling, rate *severe—unstable fill.*

Daily Cover for Landfill

Property	Limits: Good	Limits: Fair	Limits: Poor	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
3. Depth to cemented pan (inches)	>60	40-60	<40	Cemented pan.
4. Unified [1]	---	---	SP, SW, SP-SM, SW-SM, GP, GW, GP-GM, GW-GM	Seepage.
5. USDA texture [1 2 3]	---	CL, SICL, SC	SIC, C	Too clayey.
6. USDA texture [1]	---	LCOS, LS, LFS, VFS	S, FS, COS, SG	Too sandy.
7. Unified [1 3]	---	---	OL, OH, CH, MH	Hard to pack.
8. Coarse fragments (percent) [1 4]	<25	25-50	>50	Small stones.
9. Fraction greater than 3 inches (percent by weight) [1 4]	<25	25-50	>50	Large stones.
10. Slope (percent)	<8	8-15	>15	Slope.
11. Depth to high water table (feet)	---	---	+	Ponding.
	>3.5	1.5-3.5	<1.5	Wetness.
12. Unified [1]	---	---	PT	Excess humus.
13. Layer thickness (inches)	>60	40-60	<40	Thin layer.
14. Soil reaction (pH) [1]	---	---	<3.6	Too acid.
15. Salinity in the upper 60 inches (mmhos/cm) [2]	---	---	>16	Excess salt.
16. Sodium adsorption ratio or great group or phase [1 2]	---	---	>12 (halic, natric, alkali phases)	Excess sodium.
17. Carbonates	---	---	[5]	Excess lime.

[1] Thickest layer between 10 and 60 inches.
[2] Disregard in all Aridisols except Salorthids and Aquic subgroups, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic subgroups.
[3] Rate one class better if the soil is in kaolinitic family and experience confirms.
[4] 100 minus percent passing No. 10 sieve, plus fraction greater than 3 inches. Use dominant condition or restrictive feature.
[5] If the amount of carbonate is so high that plant growth is restricted, rate *poor—excess lime.*

Shallow Excavations

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches):				
Hard	>60	40-60	<40	Depth to rock.
Soft	>40	20-40	<20	Depth to rock.
3. Depth to cemented pan (inches):				
Thick	>60	40-60	<40	Cemented pan.
Thin	>40	20-40	<20	Cemented pan.
4. USDA texture (20 to 60 inches)	---	[1] SI	COS, S, FS, VFS, LCOS, LS, LFS, LVFS, G, SG	Cutbanks cave.
5. USDA texture (20 to 60 inches)	---	C, SIC	---	Too clayey.
6. Soil order	---	---	Vertisols	Cutbanks cave.
7. Bulk density between depths of 20 and 60 inches (g/cc)	---	>1.8	---	Dense layer.
8. Unified (20 to 60 inches)	---	---	OL, OH, PT	Excess humus.
9. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
10. Depth to high water table (feet)	--- >6	--- 2.5-6	+ <2.5	Ponding. Wetness.
11. Flooding	None, rare	Common	---	Flooding.
12. Slope (percent)	<8	8-15	>15	Slope.
13. Downslope movement	---	---	(3)	Slippage.

[1] In areas of loess, rating should be *slight*.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.

Dwellings Without Basements

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Flooding	None	---	Rare, common	Flooding.
4. Depth to high water table (feet)	--- >2.5	--- 1.5-2.5	+ <1.5	Ponding. Wetness.
5. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
6. Unified [1]	---	---	OL, OH, PT	Low strength.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
9. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
10. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

[1] Thickest layer between 10 and 40 inches.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.
[4] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting*.
[5] If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Dwellings With Basements

	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Flooding	None	---	Rare, common	Flooding.
4. Depth to high water table (feet)	---	---	+	Ponding.
	>6	2.5-6	<2.5	Wetness.
5. Depth to bedrock (inches):				
Hard	>60	40-60	<40	Depth to rock.
Soft	>40	20-40	<20	Depth to rock.
6. Depth to cemented pan (inches):				
Thick	>60	40-60	<40	Cemented pan.
Thin	>40	20-40	<20	Cemented pan.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
9. Unified (bottom layer)	---	---	OL, OH, PT	Low strength.
10. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

[1] Thickest layer between 10 and 60 inches.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.
[4] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting*.
[5] If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Small Commercial Buildings

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Flooding	None	---	Rare, common	Flooding.
4. Depth to high water table (feet)	--- >2.5	--- 1.5-2.5	+ <1.5	Ponding. Wetness.
5. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
6. Slope (percent)	<4	4-8	>8	Slope.
7. Unified [1]	---	---	OL, OH, PT	Low strength.
8. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
9. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
10. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

[1] Thickest layer between 10 and 40 inches.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*
[4] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting.*
[5] If the soil is susceptible to differential settling, rate *severe—unstable fill.*

Local Roads and Streets

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence (inches)	---	---	>12	Subsides.
3. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
4. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
5. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
6. AASHTO group index number [1 2 3]	<5	5-8	>8	Low strength.
7. Depth to high water table (feet)	---	---	+	Ponding.
	>2.51.0-2.5	<1.0	Wetness.	
8. Slope (percent)	<8	8-15	>15	Slope.
9. Flooding	None	Rare	Common	Flooding.
10. Potential for frost action	Low	Moderate	High	Frost action.
11. Fraction greater than 3 inches (percent by weight) [4]	<25	25-50	>50	Large stones.
12. Downslope movement	---	---	(5)	Slippage.
13. Formation of pits	---	---	(6)	Pitting.
14. Differential settling	---	---	(7)	Unstable fill.

[1] Thickest layer between 10 and 40 inches.

[2] GIN = (F-35)[.2 + .005(LL-40)] + .01 (F-15)(PI-10) where F = percent passing No. 200 sieve. If F is $\leq$35 and PI is $\geq$11, use only part 2 of equation. Use median values.

[3] Rate one class better if the soil is in a kaolinitic family and experience confirms.

[4] Weighted average to 40 inches.

[5] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*

[6] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting.*

[7] If the soil is susceptible to differential settling, rate *severe—unstable fill.*

Lawns, Landscaping, and Golf Fairways

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
3. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (halic, natric, alkali phases)	Excess sodium.
4. Soil reaction (pH) in the surface layer	---	---	>3.6	Too acid.
5. Sulfidic materials (great group)	---	---	Sulfaquents, Sulfihemists	Excess sulfur.
6. Coarse fragments in the surface layer (percent by weight) [1]	<25	25-50	>50	Small stones.
7. Fraction greater than 3 inches in the surface layer (percent by weight)	<5	5-30	>30	Large stones.
8. Depth to high water table (feet)	---	---	+	Ponding.
	>2	1-2	<1	Wetness.
9. Available water capacity (in/in) [2]	>.10	.05-.10	<.05	Droughty.
10. Flooding	None, rare	Occasional	Frequent	Flooding.
11. Slope (percent)	<8	8-15	>15	Slope.
12. Depth to bedrock (inches)	>40	20-40	<20	Depth to rock.
13. Depth to cemented pan (inches)	>40	20-40	<20	Cemented pan.
14. USDA texture (surface layer) [3]	---	---	SIC, C, SC	Too clayey.
15. USDA texture (surface layer)	---	---	FB, HM, MUCK, SP, MPT, PEAT	Excess humus.
16. USDA texture (surface layer)	---	LCOS, S	COS	Too sandy.
17. Carbonates	---	---	[4]	Excess lime.

[1] 100 minus percent passing No. 10 sieve.
[2] Weighted average to 40 inches.
[3] Rate one class better if the soil is in a kaolinitic family and experience confirms.
[4] If the amount of carbonate is so high that plant growth is restricted, rate *severe—excess lime.*

Roadfill

Property	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
3. Depth to thick cemented pan (inches)	>60	40-60	<40	Cemented pan.
4. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
5. AASHTO group index number [1] [2] [3]	<5	5-8	>8	Low strength.
6. Layer thickness (inches)	>60	30-60	<30	Thin layer.
7. Fraction greater than 3 inches (percent by weight) [4]	<25	25-50	>50	Large stones.
8. Depth to high water table (feet)	>3	1-3	<1	Wetness.
9. Slope (percent)	<15	15-25	>25	Slope.
10. Content of gypsum (percent)	---	10-15	>15	Excess gypsum.

[1] Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on the bottom layer, verify thickness.

[2] GIN = (F-35)[.2 + .005(LL-40)] + .01 (F-15)(PI-10) where F = percent passing No. 200 sieve. If F is $\leq$35 and PI is $\geq$11, use only part 2 of equation. Use median values.

[3] Rate one class better if the soil is in a kaolinitic family and experience confirms.

[4] Weighted average to 40 inches.

Sand

Property	Limits: Probable source	Limits: Improbable source	Restrictive feature
1. USDA texture	---	Ice	Permafrost.
2. Unified [1]	SW, SP, SW-SM, SP-SM	---	---
	[2] GW, [2] GP, [2] GW-GM, [2] GP-GM	---	---
	---	[3] GW, [3] GP, [3] GW-GM, [3] GP-GM	Small stones.
	---	PT	Excess humus.
	---	All other	Excess fines.
3. Layer thickness (inches)	>36	<36	Thin layer.
4. Fraction greater than 3 inches (percent by weight) [4]	<50	>50	Large stones.

[1] Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on the bottom layer, verify thickness.
[2] Percent passing No. 4 sieve minus percent passing No. 200 sieve is greater than 25.
[3] Percent passing No. 4 sieve minus percent passing No. 200 sieve is less than 25.
[4] Thickest layer between 10 and 60 inches.

Gravel

Property	Limits		Restrictive feature
	Probable source	Improbable source	
1. USDA texture	---	Ice	Permafrost.
2. Unified [1]	GW, GP, GW-GM, GP-GM	---	---
	[2] SW, [2] SP, [2] SW-SM, [2] SP-SM	[3] SW, [3] SP, [3] SW-SM, [3] SP-SM	Too sandy.
	---	PT	Excess humus.
	---	All other	Excess fines.
3. Layer thickness (inches)	>36	<36	Thin layer.
4. Fraction greater than 3 inches (percent by weight) [4]	<50	>50	Large stones.

[1] Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on the bottom layer, verify thickness.

[2] 100 minus percent passing No. 4 sieve is greater than 25.

[3] 100 minus percent passing No. 4 sieve is less than 25.

[4] Thickest layer between 10 and 60 inches.

Topsoil

Property	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>40	20-40	<20	Depth to rock.
3. Depth to cemented pan (inches)	>40	20-40	<20	Cemented pan.
4. Depth to bulk density greater than 1.8 g/cc (inches)	>40	20-40	<20	Area reclaim.
5. USDA texture [1]	---	LCOS, LS, LFS, LVFS	COS, S, FS, VFS	Too sandy.
6. USDA texture [1]	---	[2] SCL, [2] CL, [2] SICL	SIC, C, SC	Too clayey
7. USDA texture [1]	---	---	FB, HM, SP, MPT, MUCK, PEAT, CE	Excess humus.
8. Fraction greater than 3 inches (percent by weight): [3]				
0 to 40 inches	<5	5-25	>25	Large stones.
40 to 60 inches	<15	15-30	>30	Area reclaim.
9. Coarse fragments (percent): [3]				
0 to 40 inches	<5	5-25	>25	Small stones.
40 to 60 inches	<25	25-50	>50	Area reclaim.
10. Salinity (mmhos/cm) [1]	<4	4-8	>8	Excess salt.
11. Layer thickness (inches)	>40	20-40	<20	Thin layer.
12. Depth to high water table (feet)	---	---	<1	Wetness.
13. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (halic, natric, alkali phases)	Excess sodium.
14. Soil reaction (pH) [1]	---	---	<3.6	Too acid.
15. Slope (percent)	<8	8-15	>15	Slope.
16. Carbonates	---	---	(4)	Excess lime.

[1] Thickest layer between 0 and 40 inches.
[2] If the soil has more than 3 percent organic matter and less than 35 percent clay, rate *good*.
[3] 100 minus percent passing No. 10 sieve, plus fraction greater than 3 inches. Use dominant condition or restrictive feature.
[4] If the amount of carbonate is so high that plant growth is restricted, rate *poor—excess lime.*

Pond Reservoir Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Permeability between 20 and 60 inches (in/hr)	<0.6	0.6-2.0	>2.0	Seepage.
3. Depth to bedrock (inches)	>60	20-60	<20	Depth to rock.
4. Depth to cemented pan (inches)	>60	20-60	<20	Cemented pan.
5. Slope (percent)	<3	3-8	>8	Slope.
6. USDA texture (all depths)	---	---	MARL, GYP	Seepage.
7. Downslope movement	---	---	(1)	Slippage.
8. Formation of pits	---	---	(2)	Pitting.

[1] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.
[2] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate *severe—pitting*.

Embankments, Dikes, and Levees

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Layer thickness (inches)	>60	30-60	>30	Thin layer.
3. Unified [1]	---	---	GW, GP, SW, SP, GW-GM, GP-GM, SW-SM, SP-SM, [2] SM, [2] GM	Seepage.
4. Unified [1]	---	[3] GM, [4] CL	[5] ML, [6] SM, [6] SP, CL-ML	Piping.
5. Unified [1]	---	---	PT, OL, OH	Excess humus.
6. Unified [1]	---	---	MH, [7] CH	Hard to pack.
7. Fraction greater than 3 inches (percent by weight) [8]	<15	15-35	>35	Large stones.
8. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	>4	2-4	<2	Wetness.
Perched	>3	1-3	<1	Wetness.
9. Sodium adsorption ratio in the upper 40 inches or great group or phase	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
10. Salinity at any depth (mmhos/cm)	<8	8-16	>16	Excess salt.
11. Content of gypsum (percent)	---	5-10	>10	Excess gypsum.

[1] Thickest layer between 10 and 60 inches.

[2] Rate *moderate* if more than 20 percent passing No. 200 sieve and *slight* if more than 30 percent passing No. 200 sieve.

[3] Rate *slight* if less than 35 percent passing No. 200 sieve, less than 50 percent passing No. 40 sieve, and less than 65 percent passing No. 10 sieve. The soil must meet all three criteria before it is rated *slight*.

[4] Rate *slight* if PI is greater than 15.

[5] Rate *moderate* if PI is greater than 10.

[6] Rate *moderate* if less than 70 percent passing No. 40 sieve and less than 90 percent passing No. 10 sieve, and rate *slight* if less than 60 percent passing No. 40 sieve and less than 75 percent passing No. 10 sieve.

[7] Rate *moderate* if PI is less than 40.

[8] Weighted average to 40 inches.

Drainage

Property	Limits	Restricted feature [1]
1. USDA texture	Ice	Permafrost.
2. Depth to high water table (feet) [2]	[3] >3 +	Deep to water. Ponding.
3. Permeability in the upper 40 inches (in/hr)	<0.2	Percs slowly.
4. Depth to bedrock (inches)	<40	Depth to rock.
5. Depth to cemented pan (inches)	<40	Cemented pan.
6. Flooding	Common	Flooding.
7. Total subsidence	Any entry	Subsides.
8. Fraction greater than 3 inches (percent by weight) [4]	>25	Large stones.
9. Potential for frost action	High	Frost action.
10. Slope (percent)	>3	Slope.
11. USDA texture [4]	COS, S, FS, VFS, LCOS, LS, LFS, LVFS, SG, G	Cutbanks cave.
12. Salinity at any depth (mmhos/cm)	>8	Excess salt.
13. Sodium adsorption ratio in the upper 40 inches or great group or phase	>12 (natric, halic, alkali phases)	Excess sodium.
14. Sulfidic materials (great group)	Sulfaquents, Sulfihemists	Excess sulfur.
15. Soil reaction (pH) at any depth	<3.6	Too acid.
16. Downslope movement	(5)	Slippage.
17. Complex landscape	(6)	Complex slope.
18. Availability of outlets	(7)	Poor outlets.

[1] If the soil has no restrictive features, the rating is *favorable*.
[2] If the soil is deep to water, disregard other properties.
[3] For irrigated areas, consider other restrictive features if the water table is between 3 and 5 feet.
[4] Thickest layer between 10 and 60 inches.
[5] If the soil is susceptible to movement downslope when loaded, excavated, or wet, list *slippage* as a restrictive feature.
[6] If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.
[7] If good outlets are difficult to find, list *poor outlets* as a restrictive feature.

Irrigation

Property	Limits	Restrictive feature [1]
1. USDA texture	Ice	Permafrost.
2. Slope (percent)	>3	Slope.
3. Fraction greater than 3 inches (percent by weight) [2]	>25	Large stones.
4. Depth to high water table (feet)	+ [3] <3	Ponding. Wetness.
5. Available water capacity (in/in) [2]	<0.10	Droughty.
6. USDA texture (surface layer)	COS, S, FS, VFS, LCOS, LS, LFS, LVFS	Fast intake.
7. USDA texture (surface layer)	SIC, C, SC	Slow intake.
8. Wind erodibility group	1, 2, 3	Soil blowing.
9. Permeability in the upper 60 inches (in/hr)	<0.2	Percs slowly.
10. Depth to bedrock (inches)	<40	Depth to rock.
11. Depth to cemented pan (inches)	<40	Cemented pan.
12. Fragipan (great group)	All Fragi	Rooting depth.
13. Bulk density in the upper 40 inches (g/cc)	>1.7	Rooting depth.
14. Erosion factor K (surface layer)	>.35	Erodes easily.
15. Flooding	Common	Flooding.
16. Sodium adsorption ratio in the upper 40 inches or great group or phase	>12 (natric, halic, alkali phases)	Excess sodium.
17. Salinity in the upper 40 inches (mmhos/cm)	>4	Excess salt.
18. Soil reaction (pH) at any depth	<3.6	Too acid.
19. Complex landscape	(4)	Complex slope.
20. Formation of pits	(5)	Pitting.
21. Carbonates	(6)	Excess lime.

[1] If the soil has no restrictive features, the rating is *favorable*.
[2] Weighted average to 40 inches.
[3] If depth to the water table is more than 3 feet during the growing season, disregard wetness.
[4] If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.
[5] If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, list *pitting* as a restrictive feature.
[6] If the amount of carbonate is so high that plant growth is restricted, list *excess lime* as a restrictive feature.

Terraces and Diversions

Property	Limits	Restrictive feature [1]
1. USDA texture	Ice	Permafrost.
2. Slope (percent)	>8	Slope.
3. Fraction greater than 3 inches (percent by weight) [2]	>25	Large stones.
4. Depth to bedrock (inches)	<40	Depth to rock.
5. Depth to cemented pan (inches)	<40	Cemented pan.
6. Erosion factor K in the upper 40 inches	>.35	Erodes easily.
7. Depth to high water table (feet)	+ <3	Ponding. Wetness.
8. Fragipan (great group)	All Fragi	Rooting depth.
9. USDA texture [3]	COS, S, FS, LS, LCOS, SG	Too sandy.
10. Wind erodibility group	1, 2, 3	Soil blowing.
11. Permeability (in/hr) [3]	<0.2	Percs slowly.
12. Downslope movement	(4)	Slippage.
13. Complex landscape	(5)	Complex slope.
14. Availability of outlets	(6)	Poor outlets.
15. Content of gypsum (percent)	>5	Excess gypsum.

[1] If the soil has no restrictive features, the rating is *favorable.*
[2] Weighted average to 40 inches.
[3] Thickest layer between 10 and 60 inches.
[4] If the soil is susceptible to movement downslope when loaded, excavated, or wet, list *slippage* as a restrictive feature.
[5] If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.
[6] If good outlets are difficult to find, list *poor outlets* as a restrictive feature.

Grassed Waterways

Property	Limits	Restrictive feature [1]
1. USDA texture	Ice	Permafrost.
2. Moisture regime	Aridic, Torric	Too arid.
3. Fraction greater than 3 inches (percent by weight) [2]	>15	Large stones.
4. Depth to high water table (feet)	<1.5	Wetness.
5. Slope (percent)	>8	Slope.
6. Salinity in the surface layer (mmhos/cm)	>4	Excess salt.
7. Sodium adsorption ratio in the upper 40 inches or great group or phase	>12 (natric, halic, alkali phases)	Excess sodium.
8. Erosion factor K in the upper 40 inches	>.35	Erodes easily.
9. Available water capacity (in/in) [2]	<0.10	Droughty.
10. Depth to bedrock (inches)	<40	Depth to rock.
11. Depth to cemented pan (inches)	<40	Cemented pan.
12. Fragipan (great group)	All Fragi	Rooting depth.
13. Bulk density in the upper 40 inches (g/cc)	>1.7	Rooting depth.
14. Permeability in the upper 40 inches (in/hr)	<0.2	Percs slowly.

[1] If the soil has no restrictive features, the rating is *favorable*.
[2] Weighted average to 40 inches.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Newman, CA6168)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	54.5	35.6	45.1	69	21	171	2.24	0.82	3.42	4	0.0
February----	62.6	39.1	50.9	76	26	306	1.74	0.48	2.85	4	0.0
March-------	68.1	41.3	54.7	83	29	450	1.46	0.60	2.39	4	0.0
April-------	75.2	44.0	59.6	94	33	588	0.80	0.22	1.42	2	0.0
May---------	84.0	49.5	66.8	103	38	830	0.16	0.06	0.51	0	0.0
June--------	91.7	55.2	73.5	107	43	1003	0.06	0.10	0.31	0	0.0
July--------	96.3	58.6	77.5	108	48	1161	0.03	0.10	0.25	0	0.0
August------	94.2	58.0	76.1	106	48	1118	0.04	0.07	0.30	0	0.0
September---	89.2	54.3	71.8	103	44	953	0.29	0.11	1.07	0	0.0
October-----	80.4	48.2	64.3	96	35	744	0.52	0.27	1.05	1	0.0
November----	65.2	40.6	52.9	81	27	383	1.68	0.55	2.95	4	0.0
December----	54.9	35.4	45.1	69	21	174	1.51	0.48	2.45	4	0.0
Yearly:											
Average---	76.4	46.6	61.5	---	---	---	---	---	---	---	---
Extreme---	112	15	---	109	20	---	---	---	---	---	---
Total-----	---	---	---	---	---	7881	10.53	6.94	13.15	23	0.0

See footnote at end of table.

Table 1.--Temperature and Precipitation---Continued

(Recorded in the period 1961-90 at Mount Hamilton, CA5933)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	49.6	37.4	43.5	70	15	161	3.37	1.42	5.02	6	4.2
February----	50.2	37.3	43.8	68	21	150	3.17	1.05	4.90	6	1.8
March-------	50.1	36.5	43.3	69	22	152	3.34	1.57	4.87	8	4.4
April-------	55.7	39.8	47.8	78	24	254	1.92	0.70	2.93	5	2.3
May---------	64.3	46.7	55.5	84	28	467	0.55	0.14	1.12	1	0.0
June--------	72.8	55.1	64.0	90	34	691	0.14	0.08	0.43	0	0.0
July--------	79.1	63.1	71.1	94	41	910	0.05	0.14	0.37	0	0.0
August------	78.3	62.5	70.4	95	42	911	0.09	0.07	0.48	0	0.0
September---	73.8	57.1	65.4	91	39	736	0.41	0.12	1.08	0	0.0
October-----	66.0	50.7	58.3	85	31	547	1.29	0.43	2.25	2	0.0
November----	54.4	41.4	47.9	75	25	246	3.41	1.37	5.13	6	0.1
December----	49.6	37.5	43.5	68	18	167	3.03	1.05	4.66	6	1.8
Yearly:											
Average---	62.0	47.1	54.5	---	---	---	---	---	---	---	---
Extreme---	103	7	---	96	15	---	---	---	---	---	---
Total-----	---	---	---	---	---	5392	20.76	15.28	25.44	40	14.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F.)

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Newman, CA6168)

Probability	Temperature: 24 °F or lower	Temperature: 28 °F or lower	Temperature: 32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 3	February 21	April 10
2 years in 10 later than--	January 23	February 11	March 30
5 years in 10 later than--	December 18	January 17	March 8
First freezing temperature in fall:			
1 year in 10 earlier than--	December 9	November 12	November 7
2 years in 10 earlier than--	December 16	November 21	November 11
5 years in 10 earlier than--	January 1	December 17	November 21

(Recorded in the period 1961-90 at Mount Hamilton, CA5933)

Probability	Temperature: 24 °F or lower	Temperature: 28 °F or lower	Temperature: 32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 8	May 13	May 31
2 years in 10 later than--	March 17	May 4	May 23
5 years in 10 later than--	January 25	April 17	May 8
First freezing temperature in fall:			
1 year in 10 earlier than--	November 22	November 5	October 27
2 years in 10 earlier than--	December 4	November 14	November 2
5 years in 10 earlier than--	December 31	December 2	November 13

Table 3.--Growing Season

(Recorded in the period 1961-90 at Newman, CA6168)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	317	264	213
8 years in 10	338	279	228
5 years in 10	> 365	307	256
2 years in 10	> 365	335	285
1 year in 10	> 365	350	300

(Recorded in the period 1961-90 at Mount Hamilton, CA5933)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	258	192	160
8 years in 10	300	205	170
5 years in 10	> 365	231	189
2 years in 10	> 365	257	208
1 year in 10	> 365	270	218

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
100	Capay clay, 0 to 2 percent slopes	11,150	2.8
101	Capay clay, wet, 0 to 2 percent slopes	8,185	2.1
102	Capay clay, loamy substratum, 0 to 2 percent slopes	4,505	1.1
106	Capay clay, 0 to 2 percent slopes, rarely flooded	1,610	0.4
110	El Solyo silty clay loam, 0 to 2 percent slopes	4,590	1.2
111	El Solyo clay loam, wet, 0 to 2 percent slopes	1,095	0.3
116	El Solyo silty clay loam, 0 to 2 percent slopes, rarely flooded	455	0.1
120	Vernalis-Zacharias complex, 0 to 2 percent slopes	12,035	3.1
121	Vernalis loam, wet, 0 to 2 percent slopes	310	0.1
122	Vernalis loam, 0 to 2 percent slopes	8,875	2.3
123	Vernalis clay loam, wet, 0 to 2 percent slopes	1,160	0.3
125	Vernalis clay loam, 0 to 2 percent slopes	9,235	2.3
126	Vernalis-Zacharias complex, 0 to 2 percent slopes, rarely flooded	2,030	0.5
127	Vernalis loam, 0 to 2 percent slopes, rarely flooded	3,325	0.8
128	Water	675	0.2
130	Stomar clay loam, 0 to 2 percent slopes	6,695	1.7
131	Stomar clay loam, wet, 0 to 2 percent slopes	1,070	0.3
140	Zacharias clay loam, 0 to 2 percent slopes	4,235	1.1
141	Zacharias clay loam, wet, 0 to 2 percent slopes	1,855	0.5
142	Zacharias gravelly clay loam, 0 to 2 percent slopes	4,845	1.2
144	Zacharias gravelly clay loam, 2 to 5 percent slopes	3,635	0.9
145	Zacharias clay loam, 2 to 5 percent slopes	5,495	1.4
146	Zacharias clay loam, 0 to 2 percent slopes, rarely flooded	1,790	0.5
147	Zacharias gravelly clay loam, 0 to 2 percent slopes, rarely flooded	420	0.1
150	Columbia fine sandy loam, 0 to 2 percent slopes, occasionally flooded	250	0.1
151	Columbia complex, 0 to 2 percent slopes, occasionally flooded	435	0.1
153	Columbia fine sandy loam, channeled, 0 to 2 percent slopes, frequently flooded	2,590	0.7
155	Columbia fine sandy loam, 0 to 2 percent slopes, rarely flooded	210	0.1
157	Columbia complex, 0 to 2 percent slopes, rarely flooded	480	0.1
159	Columbia complex, 0 to 2 percent slopes, frequently flooded	540	0.1
160	Merritt silty clay loam, 0 to 2 percent slopes, occasionally flooded	900	0.2
165	Merritt silty clay loam, 0 to 2 percent slopes, rarely flooded	635	0.2
170	Dospalos-Bolfar complex, 0 to 2 percent slopes, occasionally flooded	860	0.2
175	Dospalos-Bolfar complex, 0 to 2 percent slopes, rarely flooded	1,205	0.3
176	Dumps	230	*
180	Dello fine sandy loam, channeled, 0 to 2 percent slopes, frequently flooded	465	0.1
190	Clear Lake clay, 0 to 2 percent slopes, occasionally flooded	420	0.1
195	Clear Lake clay, 0 to 2 percent slopes, rarely flooded	825	0.2
200	Veritas sandy loam, 0 to 2 percent slopes, rarely flooded	860	0.2
210	Cortina gravelly sandy loam, 0 to 2 percent slopes, rarely flooded	2,375	0.6
215	Yokut sandy loam, 0 to 2 percent slopes	945	0.2
220	Xerofluvents-Xerorthents complex, 0 to 5 percent slopes, occasionally flooded	2,165	0.5
245	Bolfar-Columbia complex, 0 to 2 percent slopes, rarely flooded	585	0.1
246	Bolfar-Columbia complex, 0 to 2 percent slopes, occasionally flooded	115	*
252	Chaqua-Arburua complex, 5 to 8 percent slopes	880	0.2
253	Chaqua-Arburua complex, 8 to 15 percent slopes	2,230	0.6
255	Calla-Carbona complex, 30 to 50 percent slopes	3,135	0.8
270	Elsalado fine sandy loam, 0 to 2 percent slopes, rarely flooded	1,745	0.4
271	Elsalado loam, 0 to 2 percent slopes, rarely flooded	1,960	0.5
272	Elsalado loam, wet, 0 to 2 percent slopes	190	*
273	Elsalado fine sandy loam, 0 to 2 percent slopes	780	0.2
274	Elsalado loam, 0 to 2 percent slopes	2,320	0.6
281	Carbona clay loam, 2 to 8 percent slope	345	0.1
290	Carbona-Orognen complex, 15 to 30 percent slopes	25	*
291	Carbona-Orognen complex, 30 to 50 percent slopes	450	0.1
300	Damluis clay loam, 0 to 2 percent slopes	1,795	0.5
301	Damluis clay loam, 2 to 8 percent slopes	2,900	0.7
302	Damluis gravelly clay loam, 0 to 2 percent slopes	1,280	0.3
303	Damluis gravelly clay loam, 2 to 8 percent slopes	1,515	0.4
304	Damluis gravelly clay loam, 8 to 15 percent slopes	2,185	0.6
310	Deldota clay, 0 to 2 percent slopes	330	0.1
320	Dosamigos clay loam, 0 to 2 percent slopes	365	0.1
330	Pedcat clay loam, 0 to 2 percent slopes, rarely flooded	3,695	0.9
331	Pedcat clay loam, 0 to 2 percent slopes	615	0.2

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
340	Carranza-Woo complex, 0 to 2 percent slopes	100	*
350	Woo loam, 0 to 2 percent slopes	480	0.1
400	Alo-Vaquero complex, 15 to 30 percent slopes	80	*
401	Alo-Vaquero complex, 30 to 50 percent slopes	9,480	2.4
410	Ayar clay, 30 to 50 percent slopes	815	0.2
420	Ayar-Oneil complex, 30 to 50 percent slopes	1,000	0.3
430	Vaquero-Carbona complex, 8 to 30 percent slopes	3,255	0.8
500	Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes	16,000	4.1
501	Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes	19,720	5.0
502	Arburua-Wisflat complex, 8 to 15 percent slopes	330	0.1
505	Arburua-Contra Costa-Wisflat complex, 30 to 50 percent slopes	16,010	4.1
506	Arburua-Contra Costa-Wisflat complex, 50 to 75 percent slopes	16,880	4.3
510	Arburua-Wisflat-Rock outcrop, 30 to 65 percent slopes	4,595	1.2
520	Wisflat-Rock outcrop complex, 30 to 50 percent slopes	4,940	1.3
521	Wisflat-Rock outcrop complex, 50 to 75 percent slopes	22,780	5.8
530	Oneil silt loam, 15 to 30 percent slopes	40	*
540	Oquin fine sandy loam, 15 to 30 percent slopes	550	0.1
600	Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes	14,065	3.6
601	Gonzaga-Honker-Franciscan complex, 50 to 75 percent slopes	27,695	7.0
610	Honker-Vallecitos-Honker, eroded, complex, 30 to 50 percent slopes	5,425	1.4
611	Honker-Vallecitos-Honker, eroded, complex, 50 to 75 percent slopes	19,430	4.9
612	Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes	2,770	0.7
613	Honker-Gaviota complex, 30 to 50 percent slopes	885	0.2
614	Honker-Gaviota complex, 50 to 70 percent slopes	1,300	0.3
615	Honker-Quinto complex, 30 to 50 percent slopes	260	0.1
620	Franciscan sandy loam, 50 to 70 percent slopes	2,340	0.6
625	Franciscan-Quinto-Honker complex, 50 to 75 percent slopes	10,440	2.6
630	Millsholm-Honker-Rock outcrop complex, 30 to 50 percent slopes	3,240	0.9
631	Millsholm-Honker-Rock outcrop complex, 50 to 75 percent slopes	200	*
635	Millsholm loam, 50 to 65 percent slopes	4,050	1.0
640	Quinto-Millsholm-Rock outcrop complex, 40 to 75 percent slopes	1,240	0.3
650	Quinto-Rock outcrop complex, 50 to 75 percent slopes	4,050	1.0
660	Gaviota loam, 30 to 50 percent slopes	6,110	1.5
661	Gaviota gravelly loam, 30 to 75 percent slopes, eroded	14,275	3.6
682	Henneke-Hentine-Rock outcrop complex, 30 to 70 percent slopes	6,075	1.5
683	Hentine-Rock outcrop-Henneke complex, 30 to 70 percent slopes	2,135	0.5
684	Hentine-Henneke complex, 30 to 70 percent slopes	615	0.2
685	Stonyford complex, 15 to 50 percent slopes	455	0.1
687	Hentine-Henneke-Rock outcrop complex, 30 to 70 percent slopes	2,220	0.6
690	Sehorn-Contra Costa complex, 30 to 50 percent slopes	990	0.3
695	Orognen sandy loam, 8 to 30 percent slopes	305	0.1
700	Hytop-Franciscan-Vallecitos complex, 50 to 75 percent slopes	1,485	0.4
	Total	394,215	100.0

* Less than 0.05 percent.

Table 5.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name.)

Map symbol	Soil name
100	Capay clay, 0 to 2 percent slopes (where irrigated)
101	Capay clay, wet, 0 to 2 percent slopes (where irrigated)
102	Capay clay, loamy substratum, 0 to 2 percent slopes (where irrigated)
106	Capay clay, 0 to 2 percent slopes, rarely flooded (where irrigated)
110	El Solyo silty clay loam, 0 to 2 percent slopes (where irrigated)
111	El Solyo clay loam, wet, 0 to 2 percent slopes (where irrigated)
116	El Solyo silty clay loam, 0 to 2 percent slopes, rarely flooded (where irrigated)
120	Vernalis-Zacharias complex, 0 to 2 percent slopes (where irrigated)
121	Vernalis loam, wet, 0 to 2 percent slopes (where irrigated)
122	Vernalis loam, 0 to 2 percent slopes (where irrigated)
123	Vernalis clay loam, wet, 0 to 2 percent slopes (where irrigated)
125	Vernalis clay loam, 0 to 2 percent slopes (where irrigated)
126	Vernalis-Zacharias complex, 0 to 2 percent slopes, rarely flooded (where irrigated)
127	Vernalis loam, 0 to 2 percent slopes, rarely flooded (where irrigated)
130	Stomar clay loam, 0 to 2 percent slopes (where irrigated)
131	Stomar clay loam, wet, 0 to 2 percent slopes (where irrigated)
140	Zacharias clay loam, 0 to 2 percent slopes (where irrigated)
141	Zacharias clay loam, wet, 0 to 2 percent slopes (where irrigated)
142	Zacharias gravelly clay loam, 0 to 2 percent slopes (where irrigated)
144	Zacharias gravelly clay loam, 2 to 5 percent slopes (where irrigated)
145	Zacharias clay loam, 2 to 5 percent slopes (where irrigated)
146	Zacharias clay loam, 0 to 2 percent slopes, rarely flooded (where irrigated)
147	Zacharias gravelly clay loam, 0 to 2 percent slopes, rarely flooded (where irrigated)
150	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
151	Columbia complex, 0 to 2 percent slopes, occasionally flooded (where irrigated)
153	Columbia fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequently flooded (where irrigated and either protected from flooding or not frequently flooded during the growing season)
155	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, rarely flooded (where irrigated)
157	Columbia complex, 0 to 2 percent slopes, rarely flooded (where irrigated)
159	Columbia complex, 0 to 2 percent slopes, frequently flooded (where irrigated and either protected from flooding or not frequently flooded during the growing season)
160	Merritt silty clay loam, partially drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
165	Merritt silty clay loam, partially drained, 0 to 2 percent slopes, rarely flooded (where irrigated)
170	Dospalos-Bolfar complex, 0 to 2 percent slopes, occasionally flooded (where irrigated)
175	Dospalos-Bolfar complex, 0 to 2 percent slopes, rarely flooded (where irrigated)
190	Clear Lake clay, 0 to 2 percent slopes, occasionally flooded (where irrigated)
195	Clear Lake clay, 0 to 2 percent slopes, rarely flooded (where irrigated)
200	Veritas sandy loam, 0 to 2 percent slopes, rarely flooded (where irrigated)
245	Bolfar-Columbia complex, 0 to 2 percent slopes, rarely flooded (where irrigated)
246	Bolfar-Columbia complex, 0 to 2 percent slopes, occasionally flooded (where irrigated)
270	Elsalado fine sandy loam, 0 to 2 percent slopes, rarely flooded (where irrigated)
271	Elsalado loam, 0 to 2 percent slopes, rarely flooded (where irrigated)
272	Elsalado loam, wet, 0 to 2 percent slopes (where irrigated)
273	Elsalado fine sandy loam, 0 to 2 percent slopes (where irrigated)
274	Elsalado loam, 0 to 2 percent slopes (where irrigated)
281	Carbona clay loam, 2 to 8 percent slope (where irrigated)
300	Damluis clay loam, 0 to 2 percent slopes (where irrigated)
301	Damluis clay loam, 2 to 8 percent slopes (where irrigated)
302	Damluis gravelly clay loam, 0 to 2 percent slopes (where irrigated)
303	Damluis gravelly clay loam, 2 to 8 percent slopes (where irrigated)
310	Deldota clay, 0 to 2 percent slopes (where irrigated)
350	Woo loam, 0 to 2 percent slopes (where irrigated)

Table 6.--Farmland of Statewide Importance

(Only the soils considered farmland of statewide importance are listed. Urban or built-up areas of the soils listed are not considered farmland of statewide importance.)

Map symbol	Soil name
100	Capay clay, 0 to 2 percent slopes (where irrigated)
180	Dello fine sandy loam, channeled, 0 to 2 percent slopes
210	Cortina gravelly sandy loam, 0 to 2 percent slopes, rarely flooded
215	Yokut sandy loam, 0 to 2 percent slopes
304	Damluis gravelly clay loam, 8 to 15 percent slopes
340	Carranza-Woo complex, 0 to 2 percent slopes

Table 7.--Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Soil name and map symbol	Alfalfa hay	Apricots	Almonds	Walnuts	Beans, dry lima	Tomatoes	Sugar beets
	Tons	Bu	Lbs	Tons	Bu	Tons	Tons
100------------- Capay	8.0	362	1,953	1.7	46	28.0	28.0
101------------- Capay	8.0	338	1,700	1.2	43	25.0	30.0
102------------- Capay	8.0	362	1,953	1.7	46	28.0	28.0
106------------- Capay	8.0	362	1,953	1.7	46	28.0	28.0
110------------- El Solyo	8.0	367	2,000	1.8	50	27.0	25.0
111------------- El Solyo	7.0	342	1,700	1.2	39	24.0	27.0
116------------- El Solyo	8.0	358	2,000	1.8	50	27.0	25.0
120:							
Vernalis--------	10.0	367	2,000	2.0	50	25.0	30.0
Zacharias------	10.0	366	1,900	2.0	50	30.0	32.0
121------------- Vernalis	8.0	342	1,700	1.3	39	25.0	30.0
122------------- Vernalis	10.0	366	2,000	2.0	50	25.0	30.0
123------------- Vernalis	8.0	342	1,700	1.3	39	25.0	30.0
125------------- Vernalis	10.0	367	2,000	2.0	50	25.0	30.0
126:							
Vernalis--------	10.0	367	2,000	2.0	50	25.0	30.0
Zacharias------	10.0	367	1,900	2.0	50	30.0	32.0
127------------- Vernalis	10.0	367	2,000	2.0	50	25.0	30.0
130------------- Stomar	9.0	350	1,800	1.8	46	25.0	30.0
131------------- Stomar	8.0	333	1,500	1.2	36	25.0	30.0
140------------- Zacharias	10.0	367	1,900	2.0	50	30.0	32.0
141------------- Zacharias	8.0	342	1,700	1.3	39	30.0	31.0
142------------- Zacharias	8.0	350	1,900	1.6	43	25.0	30.0

Table 7. Yields per Acre of Crops--Continued

Soil name and map symbol	Alfalfa hay	Apricots	Almonds	Walnuts	Beans, dry lima	Tomatoes	Sugar beets
	Tons	Bu	Lbs	Tons	Bu	Tons	Tons
144, 145-------- Zacharias	8.0	350	1,900	1.6	41	24.0	28.0
146------------- Zacharias	10.0	367	1,900	2.0	50	30.0	32.0
147------------- Zacharias	8.0	350	1,900	1.6	43	25.0	30.0
150------------- Columbia	8.0	208	900	1.8	46	24.0	30.0
151:							
Columbia-------	8.0	250	900	1.8	46	24.0	30.0
Columbia, sandy substratum----	7.0	208	900	1.8	46	24.0	30.0
153------------- Columbia	8.0	188	900	1.0	46	22.0	30.0
155------------- Columbia	8.0	250	1,100	2.0	50	26.0	32.0
157:							
Columbia-------	7.0	208	1,000	1.9	48	25.0	31.0
Columbia, sandy substratum----	7.0	208	1,000	1.9	48	25.0	31.0
159:							
Columbia-------	7.0	188	800	1.0	43	23.0	30.0
Columbia, sandy substratum----	8.0	250	1,100	1.0	46	24.0	30.0
160------------- Merritt	7.0	188	900	0.8	46	26.0	30.0
165------------- Merritt	8.0	208	1,000	1.0	48	30.0	32.0
170, 175:							
Dospalos-------	8.0	250	1,100	2.0	50	24.0	30.0
Bolfar---------	7.0	208	1,000	1.0	48	26.0	31.0
180------------- Dello	5.0	167	900	0.8	38	16.0	16.0
190------------- Clear Lake	10.0	208	1,000	2.0	50	27.0	32.0
195------------- Clear Lake	10.0	208	1,000	2.0	50	27.0	32.0
200------------- Veritas	10.0	354	2,000	1.2	46	23.0	30.0

Table 7.--Yields per Acre of Crops--Continued

Soil name and map symbol	Alfalfa hay	Apricots	Almonds	Walnuts	Beans, dry lima	Tomatoes	Sugar beets
	Tons	Bu	Lbs	Tons	Bu	Tons	Tons
210------------- Cortina	6.0	292	1,200	1.0	39	23.0	18.0
215------------- Yokut	6.0	292	1,200	1.0	41	24.0	18.0
220:							
Xerofluvents---	5.0	271	1,000	0.8	36	20.0	16.0
Xerorthents----	5.0	271	1,000	0.8	36	20.0	16.0
245, 246:							
Bolfar---------	7.0	250	1,100	2.0	50	28.0	31.0
Columbia, sandy substratum----	8.0	250	1,100	2.0	50	28.0	30.0
270, 271-------- Elsalado	10.0	333	2,000	2.0	45	30.0	32.0
272------------- Elsalado	8.0	292	1,800	1.8	39	27.0	30.0
273, 274-------- Elsalado	10.0	333	2,000	2.0	45	30.0	32.0
281------------- Carbona	6.0	271	1,400	1.2	29	25.0	25.0
300------------- Damluis	6.0	271	1,400	1.2	30	25.0	25.0
301------------- Damluis	6.0	271	1,400	1.2	30	25.0	25.0
302------------- Damluis	6.0	271	1,400	1.2	30	25.0	25.0
303------------- Damluis	6.0	271	1,400	1.2	30	25.0	25.0
304------------- Damluis	---	267	1,300	---	---	---	---
310------------- Deldota	7.0	271	1,400	1.2	28	25.0	28.0
320------------- Dosamigos	7.0	267	1,300	1.0	36	24.0	30.0
330, 331-------- Pedcat	6.0	---	---	---	36	20.0	22.0
340:							
Carranza--------	---	300	---	---	---	---	---
Woo-------------	8.0	250	1,500	1.0	---	---	---
350------------- Woo	8.0	400	---	2.0	33	25.0	---

Table 8.--Land Capability Classification

(Land capability is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time.)

Map symbol and soil name	Land capability N	Land capability I
100:		
Capay	4s-5	2s-5
101:		
Capay	4w-5	2w-5
102:		
Capay	4s-5	2s-5
106:		
Capay	4s-5	2s-5
110:		
El Solyo	4s-3	2s-3
111:		
El Solyo	4w-3	2w-3
116:		
El Solyo	4s-3	2s-3
120:		
Vernalis	4c-1	1
Zacharias	4c-1	1
121:		
Vernalis	4w-2	2w-2
122:		
Vernalis	4c-1	1
123:		
Vernalis	4w-2	2w-2
125:		
Vernalis	4c-1	1
126:		
Vernalis	4w-2	1
Zacharias	4w-2	1
127:		
Vernalis	4w-2	1
130:		
Stomar	4s-3	2s-3
131:		
Stomar	4w-3	2w-3
140:		
Zacharias	4c-1	1
141:		
Zacharias	4w-2	2w-2

Table 8.--Land Capability Classification--Continued

Map symbol and soil name	Land capability N	Land capability I
142:		
Zacharias	4s-4	2s-4
144:		
Zacharias	4e-4	2e-4
145:		
Zacharias	4e-1	2e-1
146:		
Zacharias	4w-2	1
147:		
Zacharias	4w-2	2w-2
150:		
Columbia	4w-2	2w-2
151:		
Columbia	4w-2	2w-2
Columbia, sandy substratum	4w-11	3w-11
153:		
Columbia	4w-2	4w-2
155:		
Columbia	4w-2	2w-2
157:		
Columbia	4w-2	2w-2
Columbia, sandy substratum	4w-11	3w-11
159:		
Columbia	4w-2	2w-2
Columbia, sandy substratum	4w-11	3w-11
160:		
Merritt	4w-2	2w-2
165:		
Merritt	4w-2	2w-2
170:		
Dospalos	4w-3	2w-3
Bolfar	4w-3	2w-3
175:		
Dospalos	4w-3	2w-3
Bolfar	4w-3	2w-3
176:		
Dumps	8	---
180:		
Dello	4w-4	3w-4

Table 8.--Land Capability Classification--Continued

Map symbol and soil name	Land capability N	Land capability I
190:		
Clear Lake	3w-5	2w-5
195:		
Clear Lake	4w-5	2w-5
200:		
Veritas	4s-8	2s-8
210:		
Cortina	4s-4	3s-4
215:		
Yokut	4s-4	3s-4
220:		
Xerofluvents	7w	---
Xerorthents	6e	---
245:		
Bolfar	4w-2	2w-2
Columbia, sandy substratum	4w-11	3w-11
246:		
Bolfar	4w-2	2w-2
Columbia, sandy substratum	4w-4	3w-4
252:		
Chaqua	4e-1	3e-1
Arburua	4e-8	3e-8
253:		
Chaqua	4e-1	3e-1
Arburua	4e-8	3e-8
255:		
Calla	6e	---
Carbona	6e	---
270:		
Elsalado	4c-1	1
271:		
Elsalado	4c-1	1
272:		
Elsalado	4w-2	2w-2
273:		
Elsalado	4c-1	1
274:		
Elsalado	4c-1	1

Table 8.--Land Capability Classification--Continued

Map symbol and soil name	Land capability N	Land capability I
281:		
Carbona	4e-5	2e-5
290:		
Carbona	4e-5	---
Orognen	4e-5	---
291:		
Carbona	6e	---
Orognen	6e	---
300:		
Damluis	4s-3	2s-3
301:		
Damluis	4e-3	2e-3
302:		
Damluis	4s-4	2s-4
303:		
Damluis	4e-4	2e-4
304:		
Damluis	4e-4	3e-4
310:		
Deldota	4w-5	2w-5
320:		
Dosamigos	6w	3w-6
330:		
Pedcat	4w-6	3w-6
331:		
Pedcat	4w-6	3w-6
340:		
Carranza	4s-11	2s-11
Woo	4s-11	2s-11
350:		
Woo	4c-11	1
400:		
Alo	4e-3	---
Vaquero	4e-3	---
401:		
Alo	6e	---
Vaquero	6e	---
410:		
Ayar	6e	---

Table 8.--Land Capability Classification--Continued

Map symbol and soil name	Land capability N	Land capability I
420:		
Ayar	6e	---
Oneil	7e	---
430:		
Vaquero	4e-3	---
Carbona	4e-3	---
500:		
Wisflat	7e	---
Arburua	6e	---
San Timoteo	6e	---
501:		
Wisflat	7e	---
Arburua	7e	---
San Timoteo	7e	---
502:		
Arburua	4e-8	---
Wisflat	7e	---
505:		
Arburua	6e	---
Contra Costa	6e	---
Wisflat	7e	---
506:		
Arburua	7e	---
Contra Costa	7e	---
Wisflat	7e	---
510:		
Arburua	6e	---
Wisflat	7e	---
Rock outcrop	8	---
520:		
Wisflat	7e	---
Rock outcrop	8	---
521:		
Wisflat	7e	---
Rock outcrop	8	---

Table 8.--Land Capability Classification--Continued

Map symbol and soil name	Land capability N	Land capability I
530:		
Oneil	6e	---
540:		
Oquin	4e-1	---
600:		
Gonzaga	6e	---
Honker	6e	---
Franciscan	6e	---
601:		
Gonzaga	7e	---
Honker	7e	---
Franciscan	7e	---
610:		
Honker	6e	---
Vallecitos	6e	---
Honker, eroded	7e	---
611:		
Honker	7e	---
Vallecitos	7e	---
Honker, eroded	7e	---
612:		
Honker	6e	---
Vallecitos	6e	---
Gonzaga	6e	---
613:		
Honker	7e	---
Gaviota	7e	---
614:		
Honker	7e	---
Gaviota	7e	---
615:		
Honker	6e	---
Quinto	7e	---
620:		
Franciscan	7e	---

Table 8.--Land Capability Classification--Continued

Map symbol and soil name	Land capability N	Land capability I
625:		
Franciscan	7e	---
Quinto	7e	---
Honker	7e	---
630:		
Millsholm	6e	---
Honker	6e	---
Rock outcrop	8	---
631:		
Millsholm	7e	---
Honker	7e	---
Rock outcrop	8	---
635:		
Millsholm	7e	---
640:		
Quinto	7e	---
Millsholm	7e	---
Rock outcrop	8	---
650:		
Quinto	7e	---
Rock outcrop	8	---
660:		
Gaviota	7e	---
661:		
Gaviota	7e	---
682:		
Henneke	7e	---
Hentine	7e	---
Rock outcrop	8	---
683:		
Hentine	7e	---
Rock outcrop	8	---
Henneke	7e	---
684:		
Hentine	7e	---
Henneke	7e	---

Table 8.--Land Capability Classification--Continued

Map symbol and soil name	Land capability N	Land capability I
685:		
Stonyford	6e	---
Stonyford	7e	---
687:		
Hentine	7e	---
Henneke	7e	---
Rock outcrop	8	---
690:		
Sehorn	6e	---
Contra Costa	6e	---
695:		
Orognen	4e-3	---
700:		
Hytop	7e	---
Franciscan	7e	---
Vallecitos	7e	---

Table 9.--Storie Index Rating

(Absence of an entry indicates that the soil was not rated.)

Soil name and map symbol	Rating factors A	B	C	X1	X2	X3	Index	Grade	Properties affecting X
100-- Capay	0.80	0.55	1.00	0.90			40	3	Drainage
101-- Capay	0.80	0.55	1.00	0.80			35	4	High water table
102-- Capay	0.80	0.55	1.00	0.90			40	3	Drainage
106-- Capay	0.80	0.55	1.00	0.90	0.95		38	4	Drainage, flooding
110-- El Solyo	0.85	0.90	1.00	1.00			77	2	None
111-- El Solyo	0.85	0.85	1.00	0.90			65	2	High water table
116-- El Solyo	1.00	0.85	1.00	0.95			73	1	Flooding
120:									
Vernalis--	1.00	0.85	1.00	1.00			83	1	None
Zacharias--	0.95	0.85	1.00	1.00					None
121-- Vernalis	1.00	1.00	1.00	0.90			95	1	High water table
122-- Vernalis	1.00	1.00	1.00	1.00			100	1	None
123-- Vernalis	1.00	0.85	1.00	1.00			77	1	High water table
125-- Vernalis	1.00	0.85	1.00	1.00			85	1	None
126:									
Vernalis--	1.00	0.85	1.00	0.95			79	2	Flooding
Zacharias--	0.95	0.85	1.00	0.95					Flooding
127-- Vernalis	1.00	1.00	1.00	0.95			95	1	Flooding
130-- Stomar	0.80	0.85	1.00	1.00			68	2	None
131-- Stomar	0.80	0.85	1.00	0.90			61	2	High water table
140-- Zacharias	0.95	0.85	1.00	1.00			81	1	None
141-- Zacharias	0.95	0.85	1.00	.090			73	2	High water table
142-- Zacharias	0.95	0.75	1.00	1.00			67	2	None
144-- Zacharias	0.95	0.70	0.90	1.00			60	2	None

Table 9.--Storie Index Rating--Continued

Soil name and map symbol	Rating factors A	B	C	X1	X2	X3	Index	Grade	Properties affecting X
145 Zacharias	0.95	0.85	1.00	1.00			81	1	None
146 Zacharias	0.95	0.85	1.00	0.95			77	2	Flooding
147 Zacharias	0.95	0.70	1.00	0.95			63	2	Flooding
150 Columbia	1.00	1.00	1.00	0.60	0.80		48	3	Drainage, flooding, channels
151:									
Columbia	1.00	1.00	1.00	0.60	0.80		46	3	Drainage, flooding
Columbia, sandy sub.	0.90	1.00	1.00	0.60	0.80				
153 Columbia	1.00	1.00	1.00	0.60	0.40	0.90	22	4	Drainage, flooding, channels
155 Columbia	1.00	1.00	1.00	0.60	0.95		57	3	Drainage, flooding
157:									
Columbia	1.00	1.00	1.00	0.65	0.95		54	3	Drainage, flooding
Columbia, sandy sub.	0.90	1.00	1.00	0.65	0.95				
159:									
Columbia	1.00	1.00	1.00	0.60	0.40		23	4	Drainage, flooding
Columbia, sandy sub.	0.90	1.00	1.00	0.60	0.40				
160 Merritt	1.00	0.90	1.00	0.40	0.80		29	4	Drainage, flooding
165 Merritt	1.00	0.90	1.00	0.40	0.95		34	4	Drainage, flooding
170:									
Dospalos	1.00	0.60	1.00	0.40	0.80		23	4	Drainage, flooding
Bolfar	1.00	0.85	1.00	0.40	0.80				Drainage, flooding
175:									
Dospalos	1.00	0.60	1.00	0.40	0.95		27	4	Drainage, flooding
Bolfar	1.00	0.85	1.00	0.40	0.95				Drainage, flooding
180 Dello	0.85	1.00	1.00	0.20	0.40	0.90	6	6	Drainage, flooding, channels
190 Clear Lake	0.80	0.55	1.00	0.80	0.80		28	4	Drainage, flooding
195 Clear Lake	0.80	0.55	1.00	0.80	0.95		32	4	Drainage, flooding
200 Veritas	0.48	0.95	1.00	0.95	0.95		41	3	Drainage, flooding
210 Cortina	0.80	0.70	1.00	0.95	0.95		51	3	Flooding, fertility
215 Yokut	0.80	0.95	1.00	1.00			76	2	None

Table 9--Storie Index Rating--Continued

Soil name and map symbol	Rating factors A	B	C	X1	X2	X3	Index	Grade	Properties affecting X
220:									
Xerofluvents	0.80	0.60	0.95	0.80	0.95		35	4	Flooding, fertility
Xerorthents	0.85	0.60	0.95	0.95	0.95				
245:									
Bolfar	1.00	1.00	1.00	0.44	0.95		44	3	Drainage, flooding
Columbia, sandy sub.	0.90	1.00	1.00	0.60	0.95				
246:									
Bolfar	1.00	1.00	1.00	0.40	0.80		37	4	Drainage, flooding
Columbia, sandy sub.	0.90	1.00	1.00	0.60	0.80				
252:									
Chaqua	0.70	1.00	0.95	1.00			63	2	None
Arburua	0.60	1.00	0.95	1.00					None
253:									
Chaqua	0.70	1.00	0.85	1.00			56	3	None
Arburua	0.60	1.00	0.85	1.00					None
255:									
Calla	0.70	0.85	0.40	1.00			26	4	None
Carbona	0.85	0.85	0.40	1.00					None
270 Elsalado	1.00	1.00	1.00	0.95			95	1	Flooding
271 Elsalado	1.00	1.00	1.00	0.95			95	1	Flooding
272 Elsalado	1.00	1.00	1.00	0.95			95	1	High water table
273 Elsalado	1.00	1.00	1.00	1.00			100	1	None
274 Elsalado	1.00	1.00	1.00	1.00			100	1	None
281 Carbona	0.85	0.85	0.90	1.00			65	2	None
290:									
Carbona	0.85	0.85	0.75	1.00			44	3	None
Oraognen	0.60	0.70	0.75	1.00					None
291:									
Carbona	0.85	0.85	0.40	1.00			23	4	None
Oraognen	0.60	0.70	0.40	1.00					None
300 Damluis	0.85	0.85	1.00	1.00			72	2	None
301 Damluis	0.85	0.85	0.90	1.00			65	2	None
302 Damluis	0.80	0.70	1.00	1.00			56	3	None
303 Damluis	0.80	0.70	0.90	1.00			50	3	None
304 Damluis	0.80	0.70	0.80	1.00			45	3	None

Table 9.--Storie Index Rating--Continued

Soil name and map symbol	Rating factors A	B	C	X1	X2	X3	Index	Grade	Properties affecting X
310: Deldota	0.80	0.55	1.00	0.60			26	4	Drainage
320: Dosamigos	0.80	0.85	1.00	0.60	0.80		33	4	Drainage, flooding, saline/sodic
330: Pedcat	0.80	0.85	1.00	0.40	0.60	0.95	16	5	Drainage, flooding, saline/sodic
331: Pedcat	0.80	0.85	1.00	0.40	0.60		16	5	Drainage, flooding, saline/sodic
340:									
Carranza	0.80	0.70	1.00	1.00			62	2	None
Woo	0.85	0.85	1.00	1.00					None
350: Woo	1.00	1.00	1.00	1.00			100	1	None
400:									
Alo	0.70	0.60	0.75	1.00			32	4	None
Vaquero	0.70	0.60	0.75	1.00					None
401:									
Alo	0.70	0.60	0.40	1.00			17	5	None
Vaquero	0.70	0.60	0.40	1.00					None
410: Ayar	0.80	0.60	0.40	1.00			19	5	None
420:									
Ayar	0.80	0.60	0.40	1.00			21	4	None
Oneil	0.60	1.00	0.40	1.00					None
430:									
Vaquero	0.70	0.60	0.75	1.00			41	3	None
Carbona	0.85	0.85	0.75	1.00					None
500:									
Wisflat	0.30	0.95	0.40	1.00			16	5	None
Arburua	0.50	1.00	0.40	1.00					None
San timoteo	0.50	0.95	0.40	1.00					None
501:									
Wisflat	0.30	0.95	0.20	1.00			7	6	Erosion
Arburua	0.50	1.00	0.20	1.00					Erosion
San timoteo	0.50	0.95	0.20	1.00					Erosion
502:									
Arburua	0.50	1.00	0.85	1.00			37	4	None
Wisflat	0.30	0.95	0.85	1.00					None
505:									
Arburua	0.50	1.00	0.40	1.00			19	5	None
Contra Costa	0.70	0.85	0.40	1.00					None
Wisflat	0.30	0.95	0.40	1.00					None
506:									
Arburua	0.50	1.00	0.20	1.00			10	5	None
Contra Costa	0.70	0.85	0.20	1.00					None
Wisflat	0.30	0.95	0.20	1.00					None
510:									
Arburua	0.50	1.00	0.35	1.00			13	5	None
Wisflat	0.30	0.95	0.35	1.00					None

Table 9.--Storie Index Rating--Continued

Soil name and map symbol	Rating factors A	B	C	X1	X2	X3	Index	Grade	Properties affecting X
510:									
Rock outcrop	0.00	0.00	0.00	0.00					
520:									
Wisflat	0.30	0.95	0.40	1.00			6	6	None
Rock outcrop	0.00	0.00	0.00	0.00					
521:									
Wisflat	0.30	0.95	0.20	1.00			3	6	None
Rock outcrop	0.00	0.00	0.00	0.00					
530	0.60	1.00	0.75	1.00			45	3	None
Oneil									
540	0.60	1.00	0.75	1.00			45	3	None
Oquin									
600:									
Gonzaga	0.60	1.00	0.40	1.00			22	4	None
Honker	0.45	0.95	0.40	1.00					None
Franciscan	0.60	1.00	0.40	1.00					None
601:									
Gonzaga	0.60	1.00	0.20	1.00			11	5	None
Honker	0.45	0.95	0.20	1.00					None
Franciscan	0.60	1.00	0.20	1.00					None
610:									
Honker	0.45	0.95	0.40	1.00			12	5	None
Vallecitos	0.40	0.70	0.40	1.00					None
Honker, eroded	0.30	0.70	0.40	0.90					Erosion
611:									
Honker	0.45	0.95	0.20	1.00			6	6	None
Vallecitos	0.40	0.60	0.20	1.00					None
Honker, eroded	0.30	0.70	0.20	0.80					Erosion
612:									
Honker	0.45	0.95	0.40	1.00			19	5	None
Vallecitos	0.40	1.00	0.40	1.00					None
Gonzaga	0.60	1.00	0.40	1.00					None
613:									
Honker	0.50	0.70	0.40	1.00			12	5	None
Gaviota	0.30	0.70	0.40	1.00					None
614:									
Honker	0.50	0.70	0.20	1.00			6	6	None
Gaviota	0.30	0.70	0.20	1.00					None
615:									
Honker	0.45	0.95	0.40	1.00			14	5	None
Quinto	0.40	0.60	0.40	1.00					None
620	0.70	0.95	0.20	1.00			13	5	None
Franciscan									
625:									
Franciscan	0.70	0.95	0.20	1.00			10	5	None
Quinto	0.40	0.60	0.20	1.00					None
Honker	0.45	0.95	0.20	1.00					None
630:									
Millsholm	0.45	1.00	0.40	1.00			14	5	None

Table 9.--Storie Index Rating--Continued

Soil name and map symbol	Rating factors A	B	C	X1	X2	X3	Index	Grade	Properties affecting X
630:									
Honker	0.45	0.95	0.40	1.00					None
Rock outcrop	0.00	0.00	0.00	0.00					None
631:									
Millsholm	0.45	1.00	0.20	1.00			7	6	None
Honker	0.45	0.95	0.20	1.00					None
Rock outcrop	0.00	0.00	0.00	0.00					None
635 Millsholm	0.45	1.00	0.25	1.00			11	5	None
640:									
Quinto	0.40	0.60	0.25	1.00			6	6	None
Millsholm	0.45	1.00	0.25	1.00					None
Rock outcrop	0.00	0.00	0.00	0.00					None
650:									
Quinto	0.40	0.60	0.20	1.00			3	6	None
Rock outcrop	0.00	0.00	0.00	0.00					None
660 Gaviota	0.30	1.00	0.30	1.00			9	6	None
661 Gaviota	0.30	0.70	0.20	0.90			4	6	Erosion
682:									
Henneke	0.40	0.70	0.30	0.60			4	6	Fertility
Hentine	0.40	0.60	0.30	0.60					Fertility
Rock outcrop	0.00	0.00	0.00	0.00					
683:									
Henneke	0.40	0.70	0.30	0.60			3	6	Fertility
Rock outcrop	0.00	0.00	0.00	0.00					
Hentine	0.40	0.70	0.30	0.60					Fertility
684:									
Henneke	0.30	0.60	0.40	0.60			4	6	Fertility
Hentine	0.45	0.70	0.40	0.60					Fertility
685:									
Stonyford	0.40	0.70	0.75	1.00			16	5	
Stonyford	0.40	0.70	0.40	1.00					
687:									
Hentine	0.30	0.60	0.30	0.60			3	6	Fertility
Henneke	0.45	0.70	0.30	0.60					Fertility
Rock outcrop	0.00	0.00	0.00	0.00					Fertility
690:									
Seahorn	0.55	0.60	0.30	1.00			18	5	Fertility
Contra Costa	0.70	0.85	0.30	1.00					Fertility
695 Orognen	0.50	0.95	0.80	1.00			38	4	None
700:									
Hytop	0.40	1.00	0.20	1.00			9	6	None
Franciscan	0.70	0.95	0.20	1.00					None
Vallecitos	0.40	0.70	0.20	1.00					None

Table 10.--Rangeland Productivity and Characteristic Plant Communities

(Only the soils that are assigned an ecological site are listed.)

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
142:					
Zacharias-------	Loamy	Favorable	3,000	soft chess	25
		Normal	2,500	filaree	15
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
144:					
Zacharias-------	Loamy	Favorable	3,000	soft chess	25
		Normal	2,500	filaree	15
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
145:					
Zacharias-------	Clayey	Favorable	3,500	soft chess	25
		Normal	2,800	filaree	15
		Unfavorable	1,200	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
147:					
Zacharias-------	Loamy	Favorable	3,000	soft chess	25
		Normal	2,500	filaree	15
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
252:					
Chaqua----------	Loamy	Favorable	3,000	soft chess	30
		Normal	2,500	filaree	15
		Unfavorable	1,200	other annual forbs	10
				foxtail fescue	5
				other annual grasses	5
				purple needlegrass	5
				red brome	5
				wild oat	5
Arburua---------	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	red brome	10
				wild oat	10
				Mediterranean barley	5
				filaree	5
				ripgut brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
253:					
Chaqua----------	Loamy	Favorable	3,000	soft chess	30
		Normal	2,500	filaree	15
		Unfavorable	1,200	other annual forbs	10
				foxtail fescue	5
				other annual grasses	5
				purple needlegrass	5
				red brome	5
				wild oat	5
Arburua---------	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	red brome	10
				wild oat	10
				Mediterranean barley	5
				filaree	5
				ripgut brome	5
255:					
Calla----------	Loamy	Favorable	3,000	soft chess	25
		Normal	2,500	red brome	15
		Unfavorable	1,200	filaree	10
				foxtail fescue	10
				wild oat	10
				burclover	5
				clover	5
				ripgut brome	5
Carbona---------	Clayey	Favorable	3,500	soft chess	25
		Normal	2,800	filaree	15
		Unfavorable	1,200	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
281:					
Carbona---------	Clayey	Favorable	3,500	soft chess	25
		Normal	2,800	filaree	15
		Unfavorable	1,200	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
290:					
Carbona---------	Clayey	Favorable	3,500	soft chess	25
		Normal	2,800	filaree	15
		Unfavorable	1,200	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
290:					
Orognen	Loamy	Favorable	2,800	soft chess	25
		Normal	2,400	filaree	15
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
291:					
Carbona	Clayey	Favorable	3,500	soft chess	25
		Normal	2,800	filaree	15
		Unfavorable	1,200	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
Orognen	Loamy	Favorable	2,800	soft chess	25
		Normal	2,400	filaree	15
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				burclover	5
				clover	5
				foxtail fescue	5
300:					
Damluis	Fine loamy	Favorable	3,500	soft chess	30
		Normal	3,200	filaree	15
		Unfavorable	1,000	other annual forbs	10
				wild oat	10
				burclover	5
				foxtail fescue	5
				red brome	5
				ripgut brome	5
301:					
Damluis	Fine loamy	Favorable	3,500	soft chess	30
		Normal	3,200	filaree	15
		Unfavorable	1,000	other annual forbs	10
				wild oat	10
				burclover	5
				foxtail fescue	5
				red brome	5
				ripgut brome	5
302:					
Damluis	Fine loamy	Favorable	3,500	soft chess	25
		Normal	3,200	filaree	15
		Unfavorable	1,000	foxtail fescue	10
				other annual forbs	10
				red brome	10
				wild oat	10
				burclover	5
				ripgut brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo-sition
			Lb/acre		Pct
303:					
Damluis	Fine loamy	Favorable	3,500	soft chess	25
		Normal	3,200	filaree	15
		Unfavorable	1,000	foxtail fescue	10
				other annual forbs	10
				red brome	10
				wild oat	10
				burclover	5
				ripgut brome	5
304:					
Damluis	Fine loamy	Favorable	3,500	soft chess	25
		Normal	3,200	filaree	15
		Unfavorable	1,000	foxtail fescue	10
				other annual forbs	10
				red brome	10
				wild oat	10
				burclover	5
				ripgut brome	5
400:					
Alo	Clayey	Favorable	3,800	wild oat	40
		Normal	3,000	soft chess	15
		Unfavorable	1,500	burclover	5
				clover	5
				filaree	5
				foxtail fescue	5
				red brome	5
				ripgut brome	5
Vaquero	Clayey	Favorable	3,500	wild oat	35
		Normal	2,800	soft chess	15
		Unfavorable	1,500	filaree	10
				foxtail fescue	10
				burclover	5
				clover	5
				other annual forbs	5
				red brome	5
401:					
Alo	Clayey	Favorable	3,800	wild oat	40
		Normal	3,000	soft chess	15
		Unfavorable	1,500	burclover	5
				clover	5
				filaree	5
				foxtail fescue	5
				red brome	5
				ripgut brome	5
Vaquero	Clayey	Favorable	3,500	wild oat	35
		Normal	2,800	soft chess	15
		Unfavorable	1,500	filaree	10
				foxtail fescue	10
				burclover	5
				clover	5
				other annual forbs	5
				red brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
410:					
Ayar	Clayey low elevation	Favorable	3,200	red brome	20
		Normal	2,800	filaree	15
		Unfavorable	1,500	clover	10
				needlegrass	10
				ripgut brome	10
				foxtail fescue	5
				lupine	5
				soft chess	5
				wild oat	5
				blue oak	1
				juniper	1
				saltbush	1
420:					
Ayar	Clayey low elevation	Favorable	3,200	red brome	20
		Normal	2,800	filaree	15
		Unfavorable	1,500	clover	10
				needlegrass	10
				ripgut brome	10
				foxtail fescue	5
				lupine	5
				soft chess	5
				wild oat	5
				blue oak	1
				juniper	1
				saltbush	1
Oneil	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	wild oat	15
		Unfavorable	1,500	filaree	10
				other annual forbs	10
				ripgut brome	10
				burclover	5
				red brome	5
430:					
Vaquero	Clayey	Favorable	3,500	wild oat	35
		Normal	2,800	soft chess	15
		Unfavorable	1,500	filaree	10
				foxtail fescue	10
				burclover	5
				clover	5
				other annual forbs	5
				red brome	5
Carbona	Clayey	Favorable	4,600	burclover	20
		Normal	3,800	red brome	20
		Unfavorable	1,500	leporinum barley	15
				soft chess	15
				filaree	10
				clover	5
				foxtail fescue	5
				ripgut brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
500:					
Wisflat---------	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
Arburua---------	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	red brome	10
				wild oat	10
				Mediterranean barley	5
				filaree	5
				ripgut brome	5
San Timoteo-----	Coarse loamy	Favorable	2,000	soft chess	25
		Normal	1,600	wild oat	20
		Unfavorable	1,000	American vetch	5
				California sagebrush	5
				buckbrush	5
				filaree	5
				foxtail fescue	5
				peavine	5
				red brome	5
				ripgut brome	5
				sugar sumac	5
				California live oak	1
501:					
Wisflat---------	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
Arburua---------	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	red brome	10
				wild oat	10
				Mediterranean barley	5
				filaree	5
				ripgut brome	5
San Timoteo-----	Coarse loamy	Favorable	2,000	soft chess	25
		Normal	1,600	wild oat	20
		Unfavorable	1,000	American vetch	5
				California sagebrush	5
				buckbrush	5
				filaree	5
				foxtail fescue	5
				peavine	5
				red brome	5
				ripgut brome	5
				sugar sumac	5
				California live oak	1

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
502:					
Arburua	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	red brome	10
				wild oat	10
				Mediterranean barley	5
				filaree	5
				ripgut brome	5
Wisflat	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
505:					
Arburua	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	blue oak	5
				filaree	5
Contra Costa	Clayey	Favorable	3,000	soft chess	30
		Normal	2,800	wild oat	20
		Unfavorable	1,500	burclover	10
				filaree	10
				California brome	5
				clover	5
				red brome	5
				ripgut brome	5
Wisflat	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
506:					
Arburua	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	blue oak	5
				filaree	5
Contra Costa	Clayey	Favorable	3,000	soft chess	30
		Normal	2,800	wild oat	20
		Unfavorable	1,500	burclover	10
				filaree	10
				California brome	5
				clover	5
				red brome	5
				ripgut brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
506:					
Wisflat	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
510:					
Arburua	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	foxtail fescue	20
		Unfavorable	1,500	blue oak	5
				filaree	5
Wisflat	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
520:					
Wisflat	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
521:					
Wisflat	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,500	filaree	10
		Unfavorable	1,000	red brome	10
				ripgut brome	10
				wild oat	10
				California sagebrush	5
				clover	5
				foxtail fescue	5
530:					
Oneil	Fine loamy	Favorable	3,500	soft chess	35
		Normal	2,800	wild oat	15
		Unfavorable	1,500	filaree	10
				other annual forbs	10
				ripgut brome	10
				burclover	5
				red brome	5
540:					
Oquin	Coarse loamy	Favorable	2,000	soft chess	30
		Normal	1,600	filaree	10
		Unfavorable	800	red brome	10
				wild oat	10
				burclover	5
				foxtail fescue	5
				ripgut brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
600:					
Gonzaga	Loamy (blue oak)	Favorable	3,000	soft chess	25
		Normal	2,000	wild oat	20
		Unfavorable	1,000	ripgut brome	15
				foxtail fescue	10
				California buckeye	5
				blue oak	5
				filaree	5
Honker	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5
Franciscan	Loamy (blue oak)	Favorable	3,000	soft chess	20
		Normal	2,000	wild oat	20
		Unfavorable	1,000	foxtail fescue	15
				California buckwheat	5
				blue oak	5
				cheat grass	5
				purple needlegrass	5
				ripgut brome	5
				gray pine	1
601:					
Gonzaga	Loamy (blue oak)	Favorable	3,000	soft chess	25
		Normal	2,000	wild oat	20
		Unfavorable	1,000	ripgut brome	15
				foxtail fescue	10
				California buckeye	5
				blue oak	5
				filaree	5
Honker	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5
Franciscan	Loamy (blue oak)	Favorable	3,000	soft chess	20
		Normal	2,000	wild oat	20
		Unfavorable	1,000	foxtail fescue	15
				California buckwheat	5
				blue oak	5
				cheat grass	5
				purple needlegrass	5
				ripgut brome	5
				gray pine	1
610:					
Honker	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
610:					
Vallecitos------	Loamy	Favorable	2,500	wild oat	30
		Normal	2,000	soft chess	20
		Unfavorable	1,200	filaree	10
				blue oak	5
				burclover	5
				needlegrass	5
				red brome	5
				ripgut brome	5
Honker, eroded--	Loamy (California sagebrush)	Favorable	2,200	red brome	20
		Normal	1,500	soft chess	20
		Unfavorable	1,000	California sagebrush	15
				foxtail fescue	15
				California buckwheat	5
				black sage	5
				filaree	5
				goldenbush	5
				wild oat	5
611:					
Honker----------	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5
Vallecitos------	Loamy	Favorable	2,500	wild oat	30
		Normal	2,000	soft chess	20
		Unfavorable	1,200	filaree	10
				blue oak	5
				burclover	5
				needlegrass	5
				red brome	5
				ripgut brome	5
Honker, eroded--	Loamy (California sagebrush)	Favorable	2,200	red brome	20
		Normal	1,500	soft chess	20
		Unfavorable	1,000	California sagebrush	15
				foxtail fescue	15
				California buckwheat	5
				black sage	5
				filaree	5
				goldenbush	5
				wild oat	5
612:					
Honker----------	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
612:					
Vallecitos------	Loamy	Favorable	2,500	soft chess	20
		Normal	2,000	wild oat	15
		Unfavorable	1,200	burclover	10
				filaree	10
				red brome	10
				California scrub oak	5
				blue oak	5
				needlegrass	5
				ripgut brome	5
Gonzaga--- -----	Loamy (blue oak)	Favorable	3,000	soft chess	25
		Normal	2,000	wild oat	20
		Unfavorable	1,000	foxtail fescue	10
				ripgut brome	10
				California buckeye	5
				California sagebrush	5
				blue oak	5
				filaree	5
				goldenbush	5
613:					
Honker----------	Clayey	Favorable	2,200	red brome	20
		Normal	1,500	soft chess	20
		Unfavorable	1,000	California sagebrush	15
				foxtail fescue	15
				California buckwheat	5
				black sage	5
				filaree	5
				goldenbush	5
				wild oat	5
Gaviota---------	Gravelly loamy	Favorable	2,500	manzanita	25
		Normal	1,800	California sagebrush	20
		Unfavorable	1,200	common chamise	10
				other annual grasses	10
				buckbrush	5
				purple needlegrass	5
614:					
Honker------ ---	Clayey	Favorable	2,200	red brome	20
		Normal	1,500	soft chess	20
		Unfavorable	1,000	California sagebrush	15
				foxtail fescue	15
				California buckwheat	5
				black sage	5
				filaree	5
				goldenbush	5
				wild oat	5
Gaviota---------	Gravelly loamy	Favorable	2,500	manzanita	25
		Normal	1,800	California sagebrush	20
		Unfavorable	1,200	common chamise	10
				other annual grasses	10
				buckbrush	5
				purple needlegrass	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
615:					
Honker----------	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5
Quinto----------	Shallow coarse loamy	Favorable	1,500	soft chess	30
		Normal	1,000	California buckwheat	15
		Unfavorable	800	red brome	10
				California sagebrush	5
				filaree	5
				foxtail fescue	5
				wild oat	5
620:					
Franciscan------	Loamy (blue oak)	Favorable	3,000	soft chess	30
		Normal	2,000	ripgut brome	15
		Unfavorable	1,000	miner's lettuce	10
				California buckeye	5
				blue oak	5
				filaree	5
				foxtail fescue	5
				gray pine	5
				sanicle	5
				wild oat	5
625:					
Franciscan------	Loamy (blue oak)	Favorable	3,000	soft chess	30
		Normal	2,000	ripgut brome	15
		Unfavorable	1,000	miner's lettuce	10
				California buckeye	5
				blue oak	5
				filaree	5
				foxtail fescue	5
				gray pine	5
				sanicle	5
				wild oat	5
Quinto----------	Shallow coarse loamy	Favorable	1,500	soft chess	30
		Normal	1,000	California buckwheat	15
		Unfavorable	800	red brome	10
				California sagebrush	5
				filaree	5
				foxtail fescue	5
				wild oat	5
Honker----------	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
630:					
Millsholm-------	Shallow loamy	Favorable	2,500	filaree	20
		Normal	1,500	foxtail fescue	20
		Unfavorable	1,200	soft chess	20
				burclover	5
				clover	5
				ripgut brome	5
				wild oat	5
Honker----------	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5
631:					
Millsholm-------	Shallow loamy	Favorable	2,500	filaree	20
		Normal	1,500	foxtail fescue	20
		Unfavorable	1,200	soft chess	20
				burclover	5
				clover	5
				ripgut brome	5
				wild oat	5
Honker----------	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	20
		Unfavorable	1,500	filaree	10
				burclover	5
				foxtail fescue	5
				red brome	5
635:					
Millsholm-------	Shallow loamy	Favorable	2,500	filaree	20
		Normal	1,500	foxtail fescue	20
		Unfavorable	1,200	soft chess	20
				burclover	5
				clover	5
				ripgut brome	5
				wild oat	5
640:					
Quinto----------	Shallow coarse loamy	Favorable	1,500	soft chess	30
		Normal	1,000	California buckwheat	15
		Unfavorable	800	red brome	10
				California sagebrush	5
				filaree	5
				foxtail fescue	5
				wild oat	5
Millsholm-------	Shallow loamy	Favorable	2,500	filaree	20
		Normal	1,500	foxtail fescue	20
		Unfavorable	1,200	soft chess	20
				burclover	5
				clover	5
				ripgut brome	5
				wild oat	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
641:					
Quinto----------	Shallow coarse loamy	Favorable	1,500	soft chess	30
		Normal	1,000	California buckwheat	15
		Unfavorable	800	red brome	10
				California sagebrush	5
				filaree	5
				foxtail fescue	5
				wild oat	5
660:					
Gaviota---------	Gravelly loamy	Favorable	2,500	manzanita	25
		Normal	1,800	California sagebrush	20
		Unfavorable	1,200	common chamise	10
				other annual grasses	10
				buckbrush	5
				purple needlegrass	5
661:					
Gaviota---------	Gravelly loamy	Favorable	2,500	manzanita	25
		Normal	1,800	California sagebrush	20
		Unfavorable	1,200	common chamise	10
				other annual grasses	10
				buckbrush	5
				purple needlegrass	5
682:					
Henneke---------	Gravelly loamy	Favorable	1,500	soft chess	35
		Normal	1,000	wild oat	15
		Unfavorable	500	buckbrush	5
				foxtail fescue	5
				gray pine	5
				manzanita	5
				purple needlegrass	5
Hentine---------	Gravelly loamy	Favorable	800	common chamise	60
		Normal	600	buckbrush	5
		Unfavorable	500	gray pine	5
				manzanita	5
				foxtail fescue	5
				purple needlegrass	5
				toyon	1
683:					
Hentine---------	Gravelly loamy (chamise)	Favorable	800	common chamise	60
		Normal	600	buckbrush	5
		Unfavorable	500	gray pine	5
				manzanita	5
				foxtail fescue	5
				purple needlegrass	5
				toyon	1
Henneke---------	Gravelly loamy	Favorable	1,500	soft chess	35
		Normal	1,000	wild oat	15
		Unfavorable	500	buckbrush	5
				foxtail fescue	5
				gray pine	5
				manzanita	5
				purple needlegrass	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
684:					
Hentine----------	Gravelly loamy (chamise)	Favorable	800	common chamise	60
		Normal	600	buckbrush	5
		Unfavorable	500	gray pine	5
				manzanita	5
				foxtail fescue	5
				purple needlegrass	5
				toyon	1
Henneke----------	Gravelly loamy (chamise)	Favorable	800	common chamise	20
		Normal	600	buckbrush	10
		Unfavorable	500	leather oak	10
				manzanita	10
				California scrub oak	5
				ceanothus	5
				foxtail fescue	5
				gray pine	5
				purple needlegrass	5
				soap plant	5
				squirreltail	5
685:					
Stonyford--------	Gravelly loamy	Favorable	2,500	chamise	25
		Normal	2,000	manzanita	20
		Unfavorable	1,500	California scrub oak	10
				ceanothus	10
				soft chess	10
				needlegrass	5
				red brome	5
				ripgut brome	5
				wild oat	5
Stonyford--------	Gravelly loamy	Favorable	2,500	chamise	25
		Normal	2,000	manzanita	20
		Unfavorable	1,500	California scrub oak	10
				ceanothus	10
				soft chess	10
				needlegrass	5
				red brome	5
				ripgut brome	5
				wild oat	5
687:					
Hentine----------	Gravelly loamy	Favorable	800	common chamise	60
		Normal	600	buckbrush	5
		Unfavorable	500	gray pine	5
				manzanita	5
				foxtail fescue	5
				purple needlegrass	5
				toyon	1
Henneke----------	Gravelly loamy	Favorable	800	common chamise	20
		Normal	600	buckbrush	10
		Unfavorable	500	leather oak	10
				manzanita	10
				California scrub oak	5
				ceanothus	5
				foxtail fescue	5
				gray pine	5
				purple needlegrass	5
				soap plant	5
				squirreltail	5

Table 10.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
690:					
Sehorn	Clayey low elevation	Favorable	2,400	soft chess	15
		Normal	2,000	wild oat	15
		Unfavorable	1,400	burclover	10
				filaree	10
				barley	5
				blue oak	5
				clover	5
				fescue	5
				needlegrass	5
				ripgut brome	5
Contra Costa	Loamy	Favorable	3,000	soft chess	30
		Normal	2,800	wild oat	20
		Unfavorable	1,500	burclover	10
				filaree	10
				California brome	5
				clover	5
				red brome	5
				ripgut brome	5
695:					
Orognen	Loamy	Favorable	3,500	soft chess	30
		Normal	3,000	wild oat	20
		Unfavorable	1,500	filaree	10
				foxtail fescue	10
				leporinum barley	10
				red brome	5
700:					
Hytop	Clayey	Favorable	4,000	wild oat	40
		Normal	3,200	soft chess	30
		Unfavorable	1,500	filaree	5
				foxtail fescue	5
				purple needlegrass	5
Franciscan	Loamy (blue oak)	Favorable	3,000	soft chess	20
		Normal	2,000	wild oat	15
		Unfavorable	1,000	foxtail fescue	10
				ripgut brome	10
				California sagebrush	5
				blue oak	5
				filaree	5
				goldenbush	5
Vallecitos	Loamy	Favorable	2,500	wild oat	30
		Normal	2,000	soft chess	20
		Unfavorable	1,200	filaree	10
				blue oak	5
				burclover	5
				needlegrass	5
				red brome	5
				ripgut brome	5

Table 11.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated.)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
100 Capay	Slight	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
101, 102 Capay	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
106 Capay	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
110, 111 El Solyo	Slight	Slight	Slight	Slight.
116 El Solyo	Severe: flooding.	Slight	Slight	Slight.
120:				
Vernalis	Slight	Slight	Slight	Slight.
Zacharias	Slight	Slight	Moderate: small stones.	Slight.
121, 122 Vernalis	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
123, 125 Vernalis	Slight	Slight	Slight	Slight.
126:				
Vernalis	Severe: flooding.	Slight	Slight	Slight.
Zacharias	Severe: flooding.	Slight	Moderate: small stones.	Slight.
127 Vernalis	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
130, 131 Stomar	Slight	Slight	Slight	Slight.
140, 141 Zacharias	Slight	Slight	Moderate: small stones.	Slight.
142, 144 Zacharias	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
145 Zacharias	Slight	Slight	Moderate: slope, small stones.	Slight.
146 Zacharias	Severe: flooding.	Slight	Moderate: small stones.	Slight.
147 Zacharias	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight.
150 Columbia	Severe: flooding.	Slight	Moderate: flooding.	Slight.
151:				
Columbia	Severe: flooding.	Slight	Moderate: flooding.	Slight.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
151:				
Columbia, sandy substratum	Severe: flooding.	Slight	Moderate: flooding.	Slight.
153 Columbia	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
155 Columbia	Severe: flooding.	Slight	Slight	Slight.
157:				
Columbia	Severe: flooding.	Slight	Slight	Slight.
Columbia, sandy substratum	Severe: flooding.	Slight	Slight	Slight.
159:				
Columbia	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
Columbia, sandy substratum	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
160 Merritt	Severe: flooding.	Slight	Moderate: flooding.	Slight.
165 Merritt	Severe: flooding.	Slight	Slight	Slight.
170:				
Dospalos	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Bolfar	Severe: flooding.	Moderate: percs slowly.	Moderate: flooding, percs slowly.	Slight.
175:				
Dospalos	Severe: flooding.	Slight	Slight	Slight.
Bolfar	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
180 Dello	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
190 Clear Lake	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
195 Clear Lake	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
200 Veritas	Severe: flooding.	Slight	Slight	Slight.
210 Cortina	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight.
215 Yokut	Slight	Slight	Moderate: small stones.	Slight.

Table 11.-Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
220:				
Xerofluvents	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight.
Xerorthents	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight.
245:				
Bolfar	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
Columbia, sandy substratum	Severe: flooding.	Slight	Slight	Slight.
246:				
Bolfar	Severe: flooding.	Moderate: percs slowly.	Moderate: flooding, percs slowly.	Slight.
Columbia, sandy substratum	Severe: flooding.	Slight	Moderate: flooding.	Slight.
252:				
Chaqua	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.
Arburua	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.
253:				
Chaqua	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.
Arburua	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.
255:				
Calla	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
270, 271 Elsalado	Severe: flooding.	Slight	Slight	Slight.
272, 273, 274 Elsalado	Slight	Slight	Slight	Slight.
281 Carbona	Slight	Slight	Moderate: slope, small stones.	Slight.
290:				
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Orognen	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
291:				
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Orognen	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
300 Damluis	Slight	Slight	Slight	Slight.
301 Damluis	Slight	Slight	Moderate: slope.	Slight.
302, 303 Damluis	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
304 Damluis	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
310 Deldota	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
320 Dosamigos	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
330 Pedcat	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
331 Pedcat	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
340:				
Carranza	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
Woo	Slight	Slight	Slight	Slight.
350 Woo	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.
400:				
Alo	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.
Vaquero	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.
401:				
Alo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vaquero	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
410 Ayar	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
420:				
Ayar	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
420:				
Oneil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
430:				
Vaquero	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
500, 501:				
Wisflat	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Arburua	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
San Timoteo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
502:				
Arburua	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.
Wisflat	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
505, 506:				
Arburua	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Contra Costa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Wisflat	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
510:				
Arburua	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Wisflat	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
520, 521:				
Wisflat	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
520, 521:				
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
530 Oneil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
540 Oquin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
600, 601:				
Gonzaga	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Franciscan	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
610, 611:				
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vallecitos	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Honker, eroded	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
612:				
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vallecitos	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Gonzaga	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
613, 614:				
Honker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Gaviota	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
615:				
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Quinto	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
620 Franciscan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
625:				
Franciscan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Quinto	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
630, 631:				
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
635 Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
640:				
Quinto	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
650:				
Quinto	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
660 Gaviota	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
661 Gaviota	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
682:				
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
682:				
Hentine	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
683:				
Hentine	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
684:				
Hentine	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
685:				
Stonyford	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.
Stonyford	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
687:				
Hentine	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
690:				
Sehorn	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
690:				
Contra Costa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
695 Orognen	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
700:				
Hytop	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Franciscan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vallecitos	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.

Table 12.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
100, 101, 102 Capay	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
106 Capay	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
110 El Solyo	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
111 El Solyo	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
116 El Solyo	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Slight.
120:						
Vernalis	Slight	Moderate: shrink-swell.	Moderate: shrink swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
Zacharias	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
121 Vernalis	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
122 Vernalis	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
123 Vernalis	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink swell.	Moderate: shrink-swell, low strength.	Slight.
125 Vernalis	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
126:						
Vernalis	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, low strength, flooding.	Slight.
Zacharias	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, low strength, flooding.	Slight.
127 Vernalis	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, low strength, flooding.	Slight.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
130 Stomar	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
131 Stomar	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
140 Zacharias	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
141 Zacharias	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
142, 144 Zacharias	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: small stones.
145 Zacharias	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
146 Zacharias	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, low strength, flooding.	Slight.
147 Zacharias	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding.	Moderate: small stones.
150 Columbia	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
151:						
Columbia	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Columbia, sandy substratum	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
153 Columbia	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
155 Columbia	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
157:						
Columbia	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Columbia, sandy substratum	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
159:						
Columbia	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
159:						
Columbia, sandy substratum	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
160 Merritt	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
165 Merritt	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
170:						
Dospalos	Moderate: too clayey, wetness, flooding.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: low strength, flooding.	Severe: too clayey.
Bolfar	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
175:						
Dospalos	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: low strength.	Moderate: droughty.
Bolfar	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
180 Dello	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
190 Clear Lake	Moderate: too clayey, wetness, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
195 Clear Lake	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
200 Veritas	Moderate: cemented pan.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
210 Cortina	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: small stones, large stones.
215 Yokut	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: droughty.
220:						
Xerofluvents	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
Xerorthents	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: small stones, droughty.
245:						
Bolfar	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.

Table 12.- Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
245:						
Columbia, sandy substratum	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
246:						
Bolfar	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Columbia, sandy substratum	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
252:						
Chaqua	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.
Arburua	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Moderate: depth to rock, shrink-swell.	Moderate: depth to rock.
253:						
Chaqua	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope.	Moderate: slope.
Arburua	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, shrink-swell, slope.	Moderate: slope, depth to rock.
255:						
Calla	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Carbona	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
270, 271 Elsalado	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
272 Elsalado	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
273, 274 Elsalado	Slight	Slight	Slight	Slight	Slight	Slight.
281 Carbona	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
290, 291:						
Carbona	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Orognen	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
300, 301-----------Damluis	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
302, 303-----------Damluis	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: small stones, large stones.
304---------------Damluis	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink swell, slope.	Severe: shrink-swell, low strength.	Moderate: small stones, large stones, slope.
310---------------Deldota	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: too clayey.
320---------------Dosamigos	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
330---------------Pedcat	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
331---------------Pedcat	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
340:						
Carranza----------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: small stones.
Woo---------------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
350---------------Woo	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
400, 401:						
Alo---------------	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
Vaquero-----------	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
410---------------Ayar	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
420:						
Ayar--------------	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
420:						
Oneil------------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
430:						
Vaquero----------	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
Carbona----------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
500, 501:						
Wisflat----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Arburua----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
San Timoteo------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
502:						
Arburua----------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, shrink-swell, slope.	Moderate: slope, depth to rock.
Wisflat----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
505, 506:						
Arburua----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Contra Costa-----	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Wisflat----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
510:						
Arburua----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Wisflat----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
520, 521:						
Wisflat	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
530 Oneil	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
540 Oquin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
600, 601:						
Gonzaga	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Honker	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Franciscan	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
610, 611:						
Honker	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Vallecitos	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
Honker, eroded	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
612:						
Honker	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Vallecitos	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
Gonzaga	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
613, 614:						
Honker	Severe: depth to rock, slope.	Severe: shrink swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Gaviota	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
615:						
Honker	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Quinto	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
620 Franciscan	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
625:						
Franciscan	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Quinto	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Honker	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
630, 631:						
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, depth to rock.
Honker	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
635 Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, depth to rock.
640:						
Quinto	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
640:						
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
650:						
Quinto	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
660, 661 Gaviota	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
682:						
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Hentine	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
683:						
Hentine	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
684:						
Hentine	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, depth to rock.
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
685:						
Stonyford	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Stonyford	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
687:						
Hentine	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, depth to rock.
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
690:						
Sehorn	Severe: depth to rock, cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
Contra Costa	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
695 Orognen	Severe: slope.	Severe: shrink swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
700:						
Hytop	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Franciscan	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vallecitos	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.

Table 13.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
100 Capay	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
101 Capay	Severe: percs slowly.	Slight	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
102 Capay	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
106 Capay	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey.
110 El Solyo	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
111 El Solyo	Severe: percs slowly.	Slight	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
116 El Solyo	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
120:					
Vernalis	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Zacharias	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
121 Vernalis	Moderate: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
122 Vernalis	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
123 Vernalis	Moderate: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
125 Vernalis	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
126:					
Vernalis	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Zacharias	Severe: percs slowly.	Slight	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
127 Vernalis	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
130 Stomar	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
131 Stomar	Severe: percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
140 Zacharias	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
141 Zacharias	Severe: percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
142 Zacharias	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
144 Zacharias	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
145 Zacharias	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
146 Zacharias	Severe: percs slowly.	Slight	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
147 Zacharias	Severe: percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey, small stones.
150 Columbia	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
151:					
Columbia	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Columbia, sandy substratum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness, thin layer.
153 Columbia	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
155 Columbia	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
157:					
Columbia	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
157:					
Columbia, sandy substratum	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.
159:					
Columbia	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Columbia, sandy substratum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness, thin layer.
160 Merritt	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too sandy.
165 Merritt	Severe: percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: flooding, wetness.	Fair: too sandy.
170:					
Dospalos	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
Bolfar	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
175:					
Dospalos	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Bolfar	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
180 Dello	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
190 Clear Lake	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
195 Clear Lake	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
200 Veritas	Moderate: flooding, cemented pan.	Severe: seepage.	Severe: cemented pan, seepage.	Severe: seepage.	Fair: cemented pan, thin layer.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
210: Cortina	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
215: Yokut	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Poor: small stones.
220:					
Xerofluvents	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage, small stones.
Xerorthents	Moderate: flooding.	Moderate: slope.	Severe: seepage.	Moderate: flooding.	Poor: small stones.
245:					
Bolfar	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Columbia, sandy substratum	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.
246:					
Bolfar	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Columbia, sandy substratum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness, thin layer.
252:					
Chaqua	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: depth to rock, too clayey.
Arburua	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
253:					
Chaqua	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: depth to rock, too clayey, slope.
Arburua	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
255: Calla	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
255:					
Carbona	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
270, 271 Elsalado	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
272 Elsalado	Moderate: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: wetness.	Good.
273, 274 Elsalado	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
281 Carbona	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
290, 291:					
Carbona	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Orognen	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
300 Damluis	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
301 Damluis	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
302 Damluis	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack, small stones.
303 Damluis	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack, small stones.
304 Damluis	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack, small stones.
310 Deldota	Severe: wetness, percs slowly.	Slight	Moderate: wetness, too clayey.	Slight	Fair: too clayey.
320 Dosamigos	Severe: wetness, percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
330 Pedcat	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey, excess sodium.	Moderate: flooding, wetness.	Poor: too clayey, excess sodium.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
331: Pedcat	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey, excess sodium.	Moderate: wetness.	Poor: too clayey, excess sodium.
340:					
Carranza	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Woo	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
350: Woo	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
400, 401:					
Alo	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
Vaquero	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
410: Ayar	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: hard to pack, slope.
420:					
Ayar	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: hard to pack, slope.
Oneil	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
430:					
Vaquero	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
Carbona	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
500, 501:					
Wisflat	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Arburua	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
500, 501:					
San Timoteo	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
502:					
Arburua	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Wisflat	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock.
505, 506:					
Arburua	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Contra Costa	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Wisflat	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
510:					
Arburua	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Wisflat	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
520, 521:					
Wisflat	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
530 Oneil	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
540 Oquin	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
600, 601:					
Gonzaga------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Honker-------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Franciscan---------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
610, 611:					
Honker-------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Vallecitos---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Honker, eroded-----	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
612:					
Honker-------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Vallecitos---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Gonzaga------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
613, 614:					
Honker-------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Gaviota------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
615:					
Honker-------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
615:					
Quinto	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
620 Franciscan	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
625:					
Franciscan	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Quinto	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Honker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
630, 631:					
Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Honker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
635 Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
640:					
Quinto	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
650:					
Quinto	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
650:					
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
660, 661 Gaviota	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
682:					
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, small stones.
Hentine	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
683:					
Hentine	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, small stones.
684:					
Hentine	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, small stones.
685:					
Stonyford	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Stonyford	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
687:					
Hentine	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, small stones.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
690:					
Sehorn	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Contra Costa	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
695 Orognen	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
700:					
Hytop	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Franciscan	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Vallecitos	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.

Table 14.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
100, 101 Capay	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
102 Capay	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
106 Capay	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
110, 111, 116 El Solyo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
120:				
Vernalis	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Zacharias	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
121, 122, 123, 125 Vernalis	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
126:				
Vernalis	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Zacharias	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
127 Vernalis	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
130 Stomar	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, thin layer.
131 Stomar	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, thin layer.
140, 141 Zacharias	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
142, 144 Zacharias	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
145, 146 Zacharias	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
147 Zacharias	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
150 Columbia	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
151:				
Columbia	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Columbia, sandy substratum	Good	Probable	Improbable: too sandy.	Good.
153, 155 Columbia	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
157, 159:				
Columbia	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Columbia, sandy substratum	Good	Probable	Improbable: too sandy.	Good.
160, 165 Merritt	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
170:				
Dospalos	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bolfar	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
175:				
Dospalos	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
Bolfar	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
180 Dello	Good	Probable	Improbable: too sandy.	Poor: too sandy.
190, 195 Clear Lake	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
200 Veritas	Fair: cemented pan, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
210 Cortina	Good	Probable	Probable	Poor: small stones, area reclaim.
215 Yokut	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
220:				
Xerofluvents	Good	Probable	Probable	Poor: small stones, area reclaim.
Xerorthents	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
245, 246:				
Bolfar	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Columbia, sandy substratum	Good	Probable	Improbable: too sandy.	Good.
252:				
Chaqua	Fair: depth to rock, shrink-swell, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Arburua	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
253:				
Chaqua	Fair: depth to rock, shrink-swell, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Arburua	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
255:				
Calla	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Carbona	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
270, 271, 272, 273, 274 Elsalado	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
281 Carbona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
290:				
Carbona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Orognen	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
291:				
Carbona	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Orognen	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
300, 301 Damluis	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
302, 303, 304 Damluis	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
310 Deldota	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
320 Dosamigos	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
330, 331 Pedcat	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
340:				
Carranza	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Woo	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
350 Woo	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
400, 401:				
Alo	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Vaquero	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
410: Ayar	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
420:				
Ayar	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Oneil	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
430:				
Vaquero	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, slope.
Carbona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
500, 501:				
Wisflat	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Arburua	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
San Timoteo	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
502:				
Arburua	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Wisflat	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
505, 506:				
Arburua	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Contra Costa	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Wisflat	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
510:				
Arburua	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Wisflat	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
520, 521:				
Wisflat	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
530 Oneil	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
540 Oquin	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
600, 601:				
Gonzaga	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Honker	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Franciscan	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
610, 611:				
Honker	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Vallecitos	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Honker, eroded	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
612:				
Honker	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Vallecitos	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Gonzaga	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
613, 614:				
Honker	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Gaviota	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
615:				
Honker	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Quinto	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
620 Franciscan	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
625:				
Franciscan	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Quinto	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Honker	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
630, 631:				
Millsholm	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
630, 631:				
Honker	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
635 Millsholm	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
640:				
Quinto	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Millsholm	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
650:				
Quinto	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
660, 661 Gaviota	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
682:				
Henneke	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Hentine	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
683:				
Hentine	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
683:				
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Henneke	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
684:				
Hentine	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Henneke	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
685:				
Stonyford	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Stonyford	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
687:				
Hentine	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Henneke	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Rock outcrop	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
690:				
Sehorn	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Contra Costa	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
695 Orognen	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
700:				
Hytop----------------	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Franciscan-----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Vallecitos ----------	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.

Table 15.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
100, 101 Capay	Slight	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
102 Capay	Moderate: seepage.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
106 Capay	Slight	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
110, 111, 116 El Solyo	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
120:						
Vernalis	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Zacharias	Slight	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
121, 122 Vernalis	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
123, 125 Vernalis	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
126:						
Vernalis	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Zacharias	Slight	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
127 Vernalis	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
130, 131 Stomar	Slight	Moderate: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily	Erodes easily, percs slowly.
140, 141 Zacharias	Slight	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
142 Zacharias	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
144 Zacharias	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
145 Zacharias	Moderate: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
146 Zacharias	Slight	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
147 Zacharias	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting- Drainage	Irrigation	Terraces and diversions	Grassed waterways
150---------------- Columbia	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
151:						
Columbia----------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
Columbia, sandy substratum------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily, flooding.	Erodes easily, soil blowing.	Erodes easily.
153------------ -- Columbia	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
155--------------- Columbia	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
157:						
Columbia----------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
Columbia, sandy substratum------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily.	Erodes easily, soil blowing.	Erodes easily.
159:						
Columbia----------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
Columbia, sandy substratum------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily, flooding.	Erodes easily, soil blowing.	Erodes easily.
160--------------- Merritt	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
165--------------- Merritt	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
170:						
Dospalos----------	Slight----------	Moderate: hard to pack, wetness.	Deep to water	Droughty, slow intake, percs slowly.	Percs slowly---	Droughty, percs slowly.
Bolfar------------	Slight----------	Moderate: piping, wetness.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
175:						
Dospalos----------	Slight----------	Moderate: hard to pack, wetness.	Deep to water	Droughty, percs slowly.	Percs slowly---	Droughty, percs slowly.
Bolfar------------	Slight----------	Moderate: piping, wetness.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
180--------------- Dello	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing, flooding.	Too sandy, soil blowing.	Droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
190-- Clear Lake	Slight--	Moderate: hard to pack, wetness.	Deep to water	Slow intake, percs slowly, flooding.	Percs slowly--	Percs slowly.
195-- Clear Lake	Slight--	Moderate: hard to pack, wetness.	Deep to water	Slow intake, percs slowly.	Percs slowly--	Percs slowly.
200-- Veritas	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing--	Favorable--	Favorable.
210-- Cortina	Severe: seepage.	Severe: seepage.	Deep to water	Droughty--	Too sandy--	Droughty.
215-- Yokut	Moderate: seepage.	Slight--	Deep to water	Droughty, soil blowing.	Favorable--	Droughty.
220:						
Xerofluvents--	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, flooding.	Too sandy--	Droughty.
Xerorthents--	Slight--	Severe: seepage.	Deep to water	Droughty--	Favorable--	Droughty.
245:						
Bolfar--	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Columbia, sandy substratum--	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily.	Erodes easily, soil blowing.	Erodes easily.
246:						
Bolfar--	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
Columbia, sandy substratum--	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily, flooding.	Erodes easily, soil blowing.	Erodes easily.
252:						
Chaqua--	Moderate: depth to rock, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Arburua--	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
253:						
Chaqua--	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Arburua--	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
255:						
Calla	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
Carbona	Severe: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Slope	Slope, percs slowly.
270 Elsalado	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily.	Erodes easily, soil blowing.	Erodes easily.
271, 272 Elsalado	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
273 Elsalado	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing, erodes easily.	Erodes easily, soil blowing.	Erodes easily.
274 Elsalado	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
281 Carbona	Moderate: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Favorable	Percs slowly.
290, 291:						
Carbona	Severe: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Slope	Slope, percs slowly.
Orognen	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, percs slowly.	Slope, droughty, percs slowly.
300 Damluis	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
301 Damluis	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly.	Percs slowly	Percs slowly.
302 Damluis	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
303 Damluis	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly.	Percs slowly	Percs slowly.
304 Damluis	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
310 Deldota	Slight	Moderate: piping.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
320 Dosamigos	Slight	Moderate: hard to pack, excess salt.	Deep to water	Percs slowly, excess salt.	Percs slowly	Percs slowly.
330, 331 Pedcat	Slight	Severe: excess sodium.	Deep to water	Droughty, percs slowly.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
340:						
Carranza	Severe: seepage.	Moderate: thin layer, piping, large stones.	Deep to water	Favorable	Large stones	Large stones.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting- Drainage	Irrigation	Terraces and diversions	Grassed waterways
340:						
Woo	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
350 Woo	Slight	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
400, 401:						
Alo	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Too arid, slope, depth to rock.
Vaquero	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Too arid, slope, depth to rock.
410 Ayar	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, percs slowly.	Too arid, slope, percs slowly.
420:						
Ayar	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, percs slowly.	Too arid, slope, percs slowly.
Oneil	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
430:						
Vaquero	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Too arid, slope, depth to rock.
Carbona	Severe: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Slope	Slope, percs slowly.
500, 501:						
Wisflat	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock.	Slope, depth to rock.
Arburua	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
San Timoteo	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
502:						
Arburua	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Wisflat	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock.	Slope, depth to rock.
505, 506:						
Arburua	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
505, 506:						
Contra Costa	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Wisflat	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock.	Slope, depth to rock.
510:						
Arburua	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Wisflat	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
520, 521:						
Wisflat	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
530 Oneil	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
540 Oquin	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
600, 601:						
Gonzaga	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Franciscan	Severe: slope.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
610, 611:						
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Vallecitos	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Honker, eroded	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
612:						
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Vallecitos	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Gonzaga	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
613, 614:						
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Gaviota	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
615:						
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Quinto	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
620 Franciscan	Severe: slope.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
625:						
Franciscan	Severe: slope.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
Quinto	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
630, 631:						
Millsholm	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
635 Millsholm	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
640:						
Quinto	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Millsholm	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
650:						
Quinto	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
660 Gaviota	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
661 Gaviota	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
682:						
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Hentine	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
683:						
Hentine	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
684:						
Hentine	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting- Drainage	Irrigation	Terraces and diversions	Grassed waterways
685:						
Stonyford	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Stonyford	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
687:						
Hentine	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
690:						
Sehorn	Severe: slope.	Severe: thin layer.	Deep to water	Slope, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Contra Costa	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
695 Orognen	Severe: slope.	Moderate: piping.	Deep to water	Slope, soil blowing, percs slowly.	Slope, soil blowing.	Slope, percs slowly.
700:						
Hytop	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Franciscan	Severe: slope.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
Vallecitos	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.

Table 16.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated.)

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
100----------------- Capay	0-20	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-60	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-35
101-------------- Capay	0-20	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-60	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
102-------------- Capay	0-20	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-35	Silty clay, clay	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	35-45	Clay loam--------	CL	A-7	0	100	100	95-100	75-95	40-50	15-25
	45-60	Loam-------------	ML, CL-ML, CL	A-4	0	90-100	85-100	75-95	50-65	25-35	5-10
106-------------- Capay	0-20	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-60	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-35
110-------------- El Solyo	0-17	Silty clay loam	ML, CL	A-6, A-7	0	100	100	95-100	75-90	35-45	10-20
	17-60	Silty clay loam, silty clay.	ML, MH, CL, CH	A-7	0	100	100	95-100	90-95	40-55	15-25
111-------------- El Solyo	0-17	Clay loam--------	ML, CL	A-6, A-7	0	100	100	95-100	75-90	35-45	10-20
	17-60	Silty clay loam, silty clay.	ML, MH, CL, CH	A-7	0	100	100	95-100	90-95	40-55	15-25
116-------------- El Solyo	0-17	Silty clay loam	ML, CL	A-6, A-7	0	100	100	95-100	75-90	35-45	10-20
	17-60	Silty clay loam, silty clay.	ML, MH, CL, CH	A-7	0	100	100	95-100	90-95	40-55	15-25
120:											
Vernalis--------	0-20	Clay loam--------	CL	A-6	0	100	95-100	85-100	65-85	30-40	10-20
	20-62	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-80	25-40	5-20
Zacharias-------	0-14	Clay loam--------	CL	A-6	0	85-100	75-100	65-90	60-80	30-40	10-15
	14-66	Clay loam, loam	CL	A-6	0	85-100	75-100	60-90	50-80	30-40	10-20
121-------------- Vernalis	0-20	Loam-------------	ML	A-4	0	100	95-100	80-100	55-85	25-35	NP-10
	20-62	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-85	25-40	5-20
122-------------- Vernalis	0-20	Loam-------------	ML	A-4	0	100	95-100	80-100	55-80	25-35	NP-10
	20-62	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-80	25-40	5-20
123-------------- Vernalis	0-20	Clay loam--------	CL	A-6	0	100	95-100	85-100	65-85	30-40	10-20
	20-62	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-85	25-40	5-20
125-------------- Vernalis	0-20	Clay loam--------	CL	A-6	0	100	95-100	85-100	65-85	30-40	10-20
	20-62	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-80	25-40	5-20
126:											
Vernalis--------	0-20	Clay loam--------	CL	A-6	0	100	95-100	85-100	65-85	30-40	10-20
	20-62	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-80	25-40	5-20
Zacharias-------	0-14	Clay loam--------	CL	A-6	0	85-100	75-100	65-90	60-80	30-40	10-15
	14-66	Clay loam, loam	CL	A-6	0	85-100	75-100	60-90	50-80	30-40	10-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
127-------------- Vernalis	0-20	Loam--------------	ML	A-4	0	100	95-100	80-100	55-80	25-35	NP-10
	20-62	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-80	25-40	5-20
130-------------- Stomar	0-20	Clay loam--------	CL	A-6	0-5	95-100	90-100	85-95	65-85	30-40	10-20
	20-38	Clay loam, clay	CL, CH	A-7	0-5	95-100	90-100	85-100	70-95	40-60	20-35
	38-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	80-95	60-85	30-45	10-20
131-------------- Stomar	0-20	Clay loam--------	CL	A-6	0	100	95-100	90-100	65-85	30-40	10-20
	20-38	Clay, clay loam	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	38-60	Clay loam, silty clay loam.	SC, CL	A-6	0	90-100	85-100	80-90	35-70	20-40	10-25
140, 141---------- Zacharias	0-14	Clay loam--------	CL	A-6	0	85-100	75-100	65-90	60-80	30-40	10-15
	14-66	Clay loam, loam	CL	A-6	0	85-100	75-100	60-90	50-80	30-40	10-20
142, 144--------- Zacharias	0-14	Gravelly clay loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-15
	14-66	Gravelly clay loam, gravelly loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-20
145, 146--------- Zacharias	0-14	Clay loam--------	CL	A-6	0	85-100	75-100	65-90	60-80	30-40	10-15
	14-66	Clay loam, loam	CL	A-6	0	85-100	75-100	60-90	50-80	30-40	10-20
147-------------- Zacharias	0-14	Gravelly clay loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-15
	14-66	Gravelly clay loam, gravelly loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-20
150-------------- Columbia	0-14	Fine sandy loam	SM, SC-SM, SC	A-4	0	100	100	85-95	35-50	20-30	NP-10
	14-60	Stratified sandy loam to fine sandy loam.	SM, SC-SM, SC	A-4	0	100	100	80-95	35-50	20-30	NP-10
151:											
Columbia--------	0-14	Fine sandy loam	SM, SC-SM, SC	A-4	0	100	100	85-95	35-50	20-30	NP-10
	14-60	Stratified sandy loam to fine sandy loam.	SM, SC-SM, SC	A-4	0	100	100	80-95	35-50	20-30	NP-10
Columbia, sandy substratum-----	0-12	Fine sandy loam	SM, SC-SM	A-4	0	100	100	85-95	35-50	20-25	NP-5
	12-41	Sandy loam-------	SM, SC-SM	A-4	0	100	100	80-95	35-50	20-25	NP-5
	41-60	Stratified sand to loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	100	95-100	40-70	5-15	---	NP
153, 155--------- Columbia	0-14	Fine sandy loam	SM, SC, SC-SM	A-4	0	100	100	85-95	35-50	20-30	NP-10
	14-60	Stratified sandy loam, fine sandy loam	SM, SC, SC-SM	A-4	0	100	100	80-95	35-50	20-30	NP-10
157:											
Columbia--------	0-14	Fine sandy loam	SM, SC, SC-SM	A-4	0	100	100	85-95	35-50	20-30	NP-10
	14-60	Stratified sandy loam, fine sandy loam	SM, SC, SC-SM	A-4	0	100	100	80-95	35-50	20-30	NP-10

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
157:											
Columbia, sandy substratum-----	0-12	Fine sandy loam	SM, SC-SM	A-4	0	100	100	85-95	35-50	20-25	NP-5
	12-41	Sandy loam-------	SM, SC-SM	A-4	0	100	100	80-95	35-50	20-25	NP-5
	41-60	Stratified sand to loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	100	95-100	40-70	5-15	---	NP
159:											
Columbia--------	0-14	Fine sandy loam	SM, SC, SC-SM	A-4	0	100	100	85-95	35-50	20-30	NP-10
	14-60	Stratified sandy loam, fine sandy loam	SM, SC, SC-SM	A-4	0	100	100	80-95	35-50	20-30	NP-10
Columbia, sandy substratum-----	0-12	Fine sandy loam	SM, SC-SM	A-4	0	100	100	85-95	35-50	20-25	NP-5
	12-41	Stratified sandy loam.	SM, SC-SM	A-4	0	100	100	80-95	35-50	20-25	NP-5
	41-60	Stratified sand to loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	100	95-100	40-70	5-15	---	NP
160, 165--------- Merritt	0-12	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	12-38	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	80-95	30-45	10-20
	38-60	Stratified loamy fine sand to silt loam.	SM, ML	A-4	0	100	100	95-100	40-60	---	NP
170:											
Dospalos--------	0-26	Clay-------------	CL	A-7	0	100	100	90-100	70-95	40-50	15-25
	26-44	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	70-95	40-65	15-35
	44-60	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0	100	100	80-100	50-85	35-60	15-30
Bolfar----------	0-24	Clay loam--------	CL	A-6	0	100	100	90-100	75-80	30-40	10-20
	24-38	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	100	100	80-100	35-80	30-40	10-20
	38-60	Stratified sandy loam to clay loam.	CL	A-6	0	100	100	80-100	50-75	30-40	10-20
175:											
Dospalos--------	0-26	Clay loam--------	CL	A-7	0	100	100	90-100	70-95	40-50	15-25
	26-44	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	70-95	40-65	15-35
	44-60	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0	100	100	80-100	50-85	35-60	15-30
Bolfar----------	0-24	Clay loam--------	CL	A-6	0	100	100	90-100	75-80	30-40	10-20
	24-38	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	100	100	80-100	35-80	30-40	10-20
	38-60	Stratified sandy loam to clay loam.	CL, SC	A-6	0	100	100	60-95	35-75	30-40	10-20
180----------- Dello	0-10	Fine sandy loam	SM, SC-SM	A-4	0	100	100	70-90	40-50	20-25	NP-5
	10-60	Stratified loamy fine sand to sand.	SM	A-2, A-3	0	100	100	50-70	5-20	---	NP
190, 195--------- Clear Lake	0-16	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
	16-60	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40

Table 16. Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
200------------- Veritas	0-21	Sandy loam-------	SM, SC-SM, SC	A-4	0	100	90-100	70-85	35-50	20-30	NP-10
	21-41	Sandy loam, fine sandy loam.	SM, SC-SM, SC	A-4	0	100	90-100	70-85	35-50	20-30	NP-10
	41-60	Cemented---------	---	---	---	---	---	---	---	---	---
210------------- Cortina	0-6	Gravelly sandy loam.	SM, GM	A-2, A-4	0-10	55-80	50-75	35-60	25-40	20-30	NP-5
	6-38	Stratified very gravelly loamy sand to very gravelly loam.	GM	A-1, A-2	0-10	30-60	25-55	15-40	5-35	20-30	NP-5
	38-60	Stratified very gravelly sand to very gravelly loamy sand.	GP	A-1	0-10	30-60	25-55	15-45	15-25	---	NP
215------------- Yokut	0-11	Sandy loam-------	SM, SC-SM, SC	A-4	0-5	90-100	85-95	55-75	35-50	20-30	NP-10
	11-19	Loam, sandy clay loam.	CL-ML, ML, SC-SM, SM	A-4	0-5	90-100	85-95	70-85	35-60	25-35	5-10
	19-60	Stratified very gravelly loam to extremely gravelly sandy clay loam.	GM-GC, GC, SC	A-1, A-2	5-25	25-65	20-50	15-50	10-35	25-40	5-15
220: Xerofluvents----	0-20	Variable---------	---	---	---	---	---	---	---	---	---
	20-60	Stratified very gravelly loamy coarse sand to sandy loam.	SM, GM, SP-SM	A-1, A-2, A-3	0-15	20-90	20-90	10-55	0-30	10-20	NP-5
Xerorthents-----	0-4	Gravelly sandy loam.	SM	A-1	0-5	50-80	50-75	30-45	5-30	20-25	NP-10
	4-60	Stratified very gravelly sandy loam to gravelly sandy loam.	SM, GM	A-1, A-2	0-15	20-80	20-75	20-55	10-30	---	NP-5
245: Bolfar----------	0-24	Loam-------------	CL-ML, ML, CL	A-4	0	100	100	85-95	60-75	25-35	5-10
	24-38	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	100	100	80-100	35-80	30-40	10-20
	38-60	Stratified sandy loam to clay loam.	CL, SC	A-6	0	100	100	60-95	35-75	30-40	10-20
Columbia, sandy substratum-----	0-12	Fine sandy loam	SM, SC-SM	A-4	0	100	100	85-95	35-50	20-25	NP-5
	12-41	Sandy loam-------	SM, SC-SM	A-4	0	100	100	80-95	35-50	20-25	NP-5
	41-60	Stratified sand to loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	100	95-100	40-70	5-15	---	NP
246: Bolfar----------	0-24	Loam-------------	CL-ML, ML, CL	A-4	0	100	100	85-95	60-75	25-35	5-10
	24-38	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	100	100	80-100	35-80	30-40	10-20
	38-60	Stratified sandy loam to clay loam.	CL	A-6	0	100	100	80-100	50-75	30-40	10-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
246:											
Columbia, sandy substratum-----	0-12	Fine sandy loam	SM, SC-SM	A-4	0	100	100	85-95	35-50	20-25	NP-5
	12-41	Sandy loam-------	SM, SC-SM	A-4	0	100	100	80-95	35-50	20-25	NP-5
	41-60	Stratified sand to loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	100	95-100	40-70	5-15	---	NP
252, 253:											
Chaqua----------	0-18	Loam-------------	CL-ML, CL, ML	A-4	0	100	95-100	85-95	55-75	25-35	5-10
	18-41	Loam, clay loam, sandy clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6	0-5	85-100	80-100	70-95	40-75	25-40	5-15
	41-45	Weathered bedrock	---	---	---	---	---	---	---	---	---
Arburua---------	0-6	Loam-------------	CL-ML, CL	A-4	0	95-100	85-100	80-95	65-75	25-30	5-10
	6-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	75-100	70-100	50-75	25-40	5-20
	22-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
	24-28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
255:											
Calla-----------	0-11	Clay loam--------	CL	A-6	0	90-100	85-100	80-95	60-75	30-40	10-15
	11-30	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
	30-60	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
Carbona---------	0-15	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	15-24	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	24-50	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	50-60	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
270-------------- Elsalado	0-6	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	75-90	35-55	20-30	NP-5
	6-26	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
	26-60	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
271, 272--------- Elsalado	0-6	Loam ----------	ML	A-4	0	95-100	90-100	75-90	50-65	20-30	NP-5
	6-26	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
	26-60	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
273-------------- Elsalado	0-6	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	75-90	35-55	20-30	NP-5
	6-26	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
	26-60	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
274-------------- Elsalado	0-6	Loam-------------	ML	A-4	0	95-100	90-100	75-90	50-65	20-30	NP-5
	6-26	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
	26-60	Fine sandy loam, loam.	SM, ML	A-4	0	95-100	90-100	75-90	35-65	20-30	NP-5
281-------------- Carbona	0-15	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	15-24	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	24-50	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	50-60	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
290, 291:											
Carbona---------	0-15	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	15-24	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	24-50	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	50-60	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
290, 291:											
Orognen	0-11	Gravelly clay loam.	GC, SC, CL	A-6	0	60-80	50-75	50-70	35-60	30-40	15-20
	11-40	Gravelly clay loam, gravelly clay.	CL, CH, GC, SC	A-7	0	55-80	50-75	45-70	40-65	40-55	20-35
	40-60	Clay loam, clay	CL, CH	A-7	0	85-95	75-90	70-85	65-80	40-60	20-40
300, 301 Damluis	0-22	Clay loam	CL	A-7	0-5	95-100	90-100	80-95	65-80	40-50	15-25
	22 30	Clay, sandy clay	CH	A-7	0-5	95-100	90-100	80-95	50-85	50 60	25-35
	30-40	Clay loam, sandy clay loam, sandy clay.	SC, CL	A-6, A-7	0-5	95-100	90-100	75-95	35-75	30-45	10-20
	40-60	Very gravelly sandy loam, very gravelly sandy clay loam.	GC, GM-GC	A-1, A 2	5-10	30 55	25 50	15-40	10-25	25-35	5-15
302, 303, 304 Damluis	0-20	Gravelly clay loam.	CL, GC	A-7	5-10	55-80	50-75	45-70	35-60	40-50	15-25
	20-48	Gravelly clay, gravelly sandy clay.	CH, GC, SC	A-7	5-10	55-80	50-75	45-75	35-60	50-60	25-35
	48-58	Gravelly clay loam, gravelly sandy clay loam, gravelly sandy clay.	SC, GC	A-6, A-7, A-2	5-10	55-80	50-75	45-70	25-50	30-45	10-20
	58-60	Very gravelly sandy loam, very gravelly sandy clay loam.	GC, GM GC	A-1, A-2	5-10	30-65	25-60	15-45	10-30	25-35	5-15
310 Deldota	0-18	Clay	CL, CH	A-7	0	100	95-100	90-100	75-95	45-60	20-30
	18-23	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	70-95	45-60	20-30
	23-60	Clay loam	ML, CL	A-6, A-7	0	100	95-100	90-100	70-80	35-45	10-20
320 Dosamigos	0-15	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-80	35-45	15-20
	15-42	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	70-95	40-55	15-30
	42-60	Clay loam, clay, sandy clay.	CL, CH	A-7, A-6	0	100	95-100	85-100	50-95	35-55	15-30
330, 331 Pedcat	0-7	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-80	30-45	10-20
	7-25	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	45-55	20-30
	25-51	Clay, clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	80-100	70-95	35-50	15-25
	51-60	Stratified sandy clay loam to clay.	CL	A-6, A-7	0	100	100	75-100	50-85	35-50	15-25
340:											
Carranza	0-10	Gravelly clay loam.	GC, CL	A-6	0-5	65-90	60 75	50-70	40 55	30-40	10 15
	10-38	Gravelly sandy clay loam, gravelly clay loam.	GC, CL	A-6	5-20	60-90	55-75	50-70	35-55	30-40	10-20
	38-60	Stratified extremely gravelly loamy sand to extremely gravelly sandy loam.	GM	A-1	5-15	15-30	10-25	10-20	5-14	15-20	NP-5

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
340:											
Woo	0-19	Clay loam	CL	A-6	0	100	95-100	90-100	70-80	30-40	10-20
	19-41	Loam, clay loam	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-95	50-75	25-40	5-20
	41-62	Stratified gravelly sandy loam to gravelly loamy sand.	SM	A-1, A-2	0	60-80	55-75	30-50	15-35	20-30	NP-5
350	0-16	Loam	CL-ML, ML	A-4	0	100	95-100	75-95	55-75	25-35	5-10
Woo	16-67	Clay loam, loam	CL-ML, CL	A-6, A-4	0	80-100	75-100	65-95	50-75	25-40	5-20
400, 401:											
Alo	0-12	Clay	CH	A-7	0	100	95-100	95-100	85-95	50-65	25-40
	12-35	Silty clay, clay, clay loam.	CL, CH	A-7	0	90-95	90-95	90-95	80-90	45-65	20-40
	35-39	Weathered bedrock	---	---	---	---	---	---	---	---	---
Vaquero	0-6	Clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	6-35	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	35-39	Weathered bedrock	---	---	---	---	---	---	---	---	---
410	0-15	Clay	CH	A-7	0	100	95-100	90-100	85-100	50-60	25-35
Ayar	15-26	Clay	CH	A-7	0	100	95-100	90-100	85-100	50-60	25-40
	26-47	Clay	CH	A-7	0	100	95-100	90-100	85-100	50-60	25-35
	47-51	Weathered bedrock	---	---	---	---	---	---	---	---	---
420:											
Ayar	0-15	Clay	CH	A-7	0	100	95-100	90-100	85-100	50-60	25-35
	15-47	Clay	CH	A-7	0	100	95-100	90-100	85-100	50-60	25-40
	47-51	Weathered bedrock	---	---	---	---	---	---	---	---	---
Oneil	0-14	Silt loam	ML	A-4	0	95-100	90-100	85-100	75-90	30-40	5-10
	14-30	Silt loam, silty clay loam.	ML	A-4, A-6, A-7	0	90-95	90-95	90-95	80-90	30-45	5-15
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
430:											
Vaquero	0-6	Clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	6-35	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	35-39	Weathered bedrock	---	---	---	---	---	---	---	---	---
Carbona	0-15	Clay loam	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	15-24	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	24-50	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	50-60	Clay loam	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
500, 501:											
Wisflat	0-5	Sandy loam	SM	A-4	0-5	90-100	75-95	50-70	35-50	20-30	NP-5
	5-10	Sandy loam, loam, gravelly sandy loam.	SM, ML	A-2, A-4	5-10	75-100	60-95	50-80	30-60	20-35	NP-10
	10-13	Weathered bedrock	---	---	---	---	---	---	---	---	---
	13-17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Arburua	0-6	Loam	CL-ML, CL	A-4	0	95-100	85-100	80-95	65-75	25-30	5-10
	6-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	75-100	70-100	50-75	25-40	5-20
	22-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
	24-28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
500, 501:											
San Timoteo-----	0-5	Sandy loam-------	SM	A-4	0	80-100	75-95	50-80	35-50	20-30	NP 5
	5-22	Loam, sandy loam	SM, ML	A-4	0	80-100	75-95	50-85	40-60	20-35	NP-10
	22-26	Weathered bedrock	---	---	---	---	---	---	---	---	---
502:											
Arburua---------	0-6	Loam-------------	CL-ML, CL	A-4	0	95 100	85-100	80-95	65-75	25-30	5-10
	6-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	75-100	70-100	50-75	25-40	5-20
	22-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
	24-28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wisflat---------	0-5	Sandy loam -----	SM	A-4	0-5	90-100	75-95	50-70	35-50	20-30	NP-5
	5-10	Sandy loam, loam, gravelly sandy loam.	SM, ML	A-2, A-4	5 10	75-100	60-95	50-80	30-60	20-35	NP-10
	10-13	Weathered bedrock	---	---	---	---	---	---	---	---	---
	13-17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
505, 506:											
Arburua---------	0-6	Loam-------------	CL-ML, CL	A-4	0	95-100	85-100	80-95	65-75	25-30	5-10
	6-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	75-100	70-100	50-75	25-40	5-20
	22-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
	24-28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Contra Costa----	0-9	Clay loam--------	CL	A-6	0	80-100	75-100	70-100	50-70	30-40	10-20
	9-38	Clay, clay loam	CL, CH	A-7	0	90-100	85-100	80-100	75-95	40-55	20-30
	38-42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wisflat---------	0-5	Sandy loam-------	SM	A-4	0-5	90-100	75-95	50-70	35-50	20-30	NP-5
	5-10	Sandy loam, loam, gravelly sandy loam.	SM, ML	A-2, A-4	5-10	75-100	60-95	50-80	30-60	20-35	NP-10
	10-13	Weathered bedrock	---	---	---	---	---	---	---	---	---
	13-17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
510:											
Arburua---------	0-6	Loam-------------	CL-ML, CL	A-4	0	95-100	85-100	80-95	65-75	25-30	5-10
	6-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	75-100	70-100	50-75	25-40	5-20
	22-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
	24-28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wisflat---------	0-5	Sandy loam-------	SM	A-4	0-5	90-100	75-95	50-70	35-50	20-30	NP-5
	5-10	Sandy loam, loam, gravelly sandy loam.	SM, ML	A-2, A-4	5-10	75-100	60-95	50-80	30-60	20-35	NP-10
	10-13	Weathered bedrock	---	---	---	---	---	---	---	---	---
	13-17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
520, 521:											
Wisflat---------	0-5	Sandy loam-------	SM	A-4	0-5	90-100	75-95	50-70	35-50	20-30	NP-5
	5-10	Sandy loam, loam, gravelly sandy loam.	SM, ML	A-2, A-4	5-10	75-100	60-95	50-80	30-60	20-35	NP-10
	10-13	Weathered bedrock	---	---	---	---	---	---	---	---	---
	13-17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
520, 521:											
Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
530 Oneil	0-14	Silt loam	ML	A-4	0	95-100	90-100	85-100	75-90	30-40	5-10
	14-30	Silt loam, silty clay loam.	ML	A-4, A-6, A-7	0	90-95	90-95	90-95	80-90	30-45	5-15
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---		---
540 Oquin	0-24	Fine sandy loam	SM	A-4	0	95-100	90-100	65-85	35-50	20-30	NP-5
	24-31	Sandy loam, fine sandy loam, loam.	SM	A-4, A-2	0	100	95-100	60-70	30-50	20-30	NP-5
	31-35	Weathered bedrock	---	---	---	---	---	---	---	---	---
600, 601:											
Gonzaga	0-18	Loam	CL-ML, CL	A-4, A-6	0	90-100	85-100	65-95	50-65	25-35	5-15
	18-29	Gravelly loam, gravelly sandy clay loam.	SC-SM, SC, GM-GC, GC	A-4, A-6	0-10	60-80	55-75	50-70	35-50	25-35	5-15
	29-38	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	38-42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Honker	0-7	Sandy loam	SC-SM, SC	A-4	0-5	90-100	85-100	50-70	35-50	20-30	5-10
	7-16	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	95-100	90-100	75-95	40-70	30-40	10-20
	16-36	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Franciscan	0-14	Gravelly sandy loam.	GC, SC, GM-GC, SC-SM	A-2-4	0-5	65-80	60-75	45-60	25-35	20-30	5-10
	14-29	Gravelly loam, cobbly loam, cobbly clay loam.	CL, SC, GC	A-6	5-25	70-85	65-80	60-75	35-55	30-40	10-20
	29-33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
610, 611:											
Honker	0-7	Sandy loam	SC-SM, SC	A-4	0-5	90-100	85-100	50-70	35-50	20-30	5-10
	7-16	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	95-100	90-100	75-95	40-70	30-40	10-20
	16-36	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
610, 611:											
Vallecitos	0-7	Gravelly loam	SC, SC-SM, GC, GM-GC	A-4, A-6	0-5	70-80	60-75	55-70	35-50	25-35	5-15
	7-16	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	40-60	40-60	20-35
	16-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Honker, eroded	0-4	Gravelly loam	SC-SM, SC, GM-GC, GC	A-4, A-6	0-10	60-80	55-75	50-70	35-50	25-35	5-15
	4-29	Gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	29-33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
612:											
Honker	0-7	Sandy loam	SC-SM, SC	A-4	0-5	90-100	85-100	50-70	35-50	20-30	5-10
	7-16	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	95-100	90-100	75-95	40-70	30-40	10-20
	16-36	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Vallecitos	0-7	Loam	CL, CL-ML	A-4, A-6	0-5	85-100	75-90	60-75	50-60	25-35	5-15
	7-16	Clay loam, clay	CL, CH	A-7	0	85-100	75-90	65-75	55-75	40-55	20-30
	16-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gonzaga	0-18	Loam	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	65-95	50-65	25-35	5-15
	18-29	Sandy clay loam, loam, clay loam.	CL-ML, CL, SC-SM, SC	A-6, A-4	0-5	90-100	85-100	70-85	40-70	25-35	5-15
	29-38	Clay, sandy clay, clay loam.	CL, CH	A-7	0-5	90-100	85-100	70-90	50-85	40-60	20-35
	38-42	Unweathered bedrock.	---		---	---	---	---	---	---	---
613, 614:											
Honker	0-5	Gravelly loam	SC-SM, SC, GM-GC, GC	A-4, A-6	0-10	60-80	55-75	50-70	35-50	25-35	5-15
	5-20	Gravelly clay loam, gravelly sandy clay loam.	SC, GC, CL	A-2, A-6	0-5	55-80	50-75	45-70	25-60	30-40	10-20
	20-36	Gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gaviota	0-10	Gravelly loam	GM, SM	A-4	0-5	65-80	60-75	55-65	35-50	20-35	NP-10
	10-14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
615:											
Honker----------	0-7	Sandy loam-------	SC-SM, SC	A-4	0 5	90-100	85-100	50-70	35-50	20-30	5-10
	7-16	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	95-100	90-100	75-95	40-70	30-40	10-20
	16-36	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Quinto----------	0-6	Gravelly sandy loam.	SC-SM, GM-GC, GC, SC	A-2	0-5	55-80	50-75	35-50	25-35	20-30	5-10
	6-17	Gravelly sandy clay loam.	GC, SC	A-2, A-6	0-10	55 80	50-75	45-65	25-50	30-40	10-20
	17-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
620-------------- Franciscan	0-10	Sandy loam-------	SC-SM, SC	A-4	0	90-100	85-100	50-65	35-50	20-30	5-10
	10-26	Sandy clay loam, clay loam.	CL, SC	A-6	0	100	85-100	70-85	35-60	30-40	10-20
	26-38	Gravelly sandy clay loam, gravelly clay loam.	SC, GC	A 2, A-6	0-5	55-80	50-75	45-70	25-50	30-40	10-20
	38-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
625:											
Franciscan------	0-10	Sandy loam-------	SC-SM, SC	A-4	0	90-100	85-100	50-65	35-50	20-30	5-10
	10-26	Sandy clay loam, clay loam.	CL, SC	A-6	0	100	85-100	70-85	35-60	30-40	10-20
	26-38	Gravelly sandy clay loam, gravelly clay loam.	SC, GC	A-2, A-6	0-5	55-80	50-75	45-70	25-50	30-40	10-20
	38-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Quinto----------	0-6	Gravelly sandy loam.	SC-SM, GM-GC, GC, SC	A-2	0-5	55-80	50-75	35-50	25-35	20-30	5-10
	6-17	Gravelly sandy clay loam.	GC, SC	A-2, A-6	0 10	55-80	50-75	45-65	25-50	30-40	10-20
	17-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Honker----------	0-7	Sandy loam-------	SC-SM, SC	A-4	0-5	90-100	85-100	50-70	35-50	20-30	5-10
	7-16	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	95-100	90-100	75-95	40-70	30-40	10 20
	16-36	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
630, 631:											
Millsholm-------	0-19	Loam-------------	ML, CL-ML, CL	A-4	0	80-100	75-100	70 95	50-75	25-35	5-10
	19-23	Unweathered bedrock.	---	---	---	---	-	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
630, 631:											
Honker----------	0-7	Sandy loam-------	SC-SM, SC	A-4	0-5	90-100	85-100	50-70	35-50	20-30	5-10
	7-16	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	95-100	90-100	75-95	40-70	30-40	10-20
	16-36	Gravelly clay loam, gravelly clay, gravelly sandy clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
635-------------- Millsholm	0-19	Loam-------------	ML, CL-ML, CL	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
640:											
Quinto----------	0-6	Gravelly sandy loam.	SC-SM, GM-GC, GC, SC	A-2	0-5	55-80	50-75	35-50	25-35	20-30	5-10
	6-17	Gravelly sandy clay loam.	GC, SC	A-2, A 6	0-10	55-80	50-75	45-65	25-50	30-40	10-20
	17-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Millsholm-------	0-19	Loam-------------	ML, CL-ML, CL	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
650:											
Quinto----------	0-6	Gravelly sandy loam.	SC-SM, GM-GC, GC, SC	A-2	0-5	55-80	50-75	35-50	25-35	20-30	5-10
	6-17	Gravelly sandy clay loam.	GC, SC	A-2, A-6	0-10	55-80	50-75	45-65	25-50	30-40	10-20
	17-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---		---	---	---	---	---
660-------------- Gaviota	0-10	Loam-------------	ML	A-4	0	90-100	85-100	60-90	50-65	20-35	NP-10
	10-14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
661-------------- Gaviota	0-10	Gravelly loam----	GM, SM	A-4	0-5	65-80	60-75	55-65	35-50	20-35	NP-10
	10-14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
682:											
Henneke---------	0-5	Gravelly loam----	GM-GC, SC-SM, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	5-9	Gravelly clay loam.	GC, CL, SC	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	9-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hentine---------	0-4	Gravelly loam----	GM-GC, GM, SC-SM, GC	A-4	0	55-80	50-75	45-70	35-50	25-35	5-10
	4-17	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-5	40-60	35-50	30-45	25-35	30-40	10-20
	17-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
683:											
Hentine---------	0-4	Gravelly loam----	GM-GC, GM, SC-SM, GC	A-4	0	55-80	50-75	45-70	35-50	25-35	5-10
	4-17	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-5	40-60	35-50	30-45	25-35	30-40	10-20
	17-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Henneke---------	0-5	Gravelly loam----	GM-GC, SC-SM, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	5-9	Gravelly clay loam.	GC, CL, SC	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	9-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
684:											
Hentine---------	0-4	Very cobbly loam	GM-GC, GM, SC-SM	A-4	50-70	55-80	50-75	45-70	35-50	25-35	5-10
	4-14	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-5	40-60	35-50	30-45	25-35	30-40	10-20
	14-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
684:											
Henneke----------	0-5	Gravelly loam----	GM-GC, SC-SM, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	5-9	Gravelly clay loam.	GC, CL, SC	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	9-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25 50	20-40	40-60	15-30
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
685:											
Stonyford--------	0-6	Gravelly loam----	GM-GC, GM, SC-SM, SM	A-4	0-5	55-80	50-75	45-65	35-50	25-35	5-10
	6-17	Gravelly clay loam.	GC, CL, SC	A-6	0-5	55-80	50-75	45-70	35-60	30-40	10-15
	17-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Stonyford--------	0-6	Gravelly loam----	GM-GC, GM, SC-SM, SM	A-4	0-5	55-80	50-75	45-65	35-50	25-35	5-10
	6-17	Gravelly clay loam.	GC, CL, SC	A-6	0-5	55-80	50-75	45-70	35-60	30-40	10-15
	17-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
687:											
Hentine----------	0-4	Very cobbly loam	GM-GC, GM, SC-SM	A-4	50-70	55-80	50-75	45-70	35-50	25-35	5-10
	4-14	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-5	40-60	35-50	30-45	25-35	30-40	10-20
	14-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Henneke----------	0-5	Gravelly loam----	GM-GC, SC-SM, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	5-9	Gravelly clay loam.	GC, CL, SC	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	9-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop-----	0-60	Unweathered bedrock.	---				---	---	---	---	---
690:											
Sehorn-----------	0-7	Clay-------------	CL, CH	A-7	0	100	95-100	90-100	85-95	45-60	25-35
	7-26	Clay, silty clay	CL, CH	A-7	0	100	95-100	90-100	85-95	45-60	25-35
	26-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Contra Costa-----	0-9	Clay loam--------	CL	A-6	0	80-100	75-100	70-100	50-70	30-40	10-20
	9-38	Clay, clay loam	CL, CH	A-7	0	90-100	85-100	80-100	75-95	40-55	20-30
	38-42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
695-------------- Orognen	0-5	Sandy loam-------	SM	A-4	0	95-100	85-100	55-70	35-50	20-30	NP-5
	5 19	Sandy clay loam, loam, gravelly sandy clay loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	75-100	70-100	60-95	35-60	25-35	5-15
	19-47	Clay, sandy clay, clay loam.	CH, CL	A-7	0	90-100	85-100	75-100	60-95	40-65	20-40
	47-60	Gravelly clay loam, gravelly sandy clay loam, clay loam.	GC, SC, CL	A-6, A-7	0-5	55-90	50-85	40-80	35-70	30-45	10-20
700:											
Hytop----------	0-11	Loam-------------	CL-ML, CL	A-4	0-5	90-100	80-100	70-90	50-65	25-30	5 10
	11-39	Clay loam, clay	CL, CH	A-7	0-5	90-100	85-100	75-95	60-90	40-55	20-30
	39-43	Weathered bedrock	---	---	---	---	---	---	---	---	---
Franciscan------	0-10	Sandy loam-------	SC-SM, SC	A-4	0	90-100	85-100	50-65	35-50	20-30	5-10
	10-26	Sandy clay loam, clay loam.	CL, SC	A-6	0	90-100	85-100	70-85	35-60	30-40	10-20
	26-38	Gravelly sandy clay loam, gravelly clay loam.	SC, GC	A-2, A-6	0-5	55-80	50-75	45-70	25-50	30-40	10-20
	38-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Vallecitos------	0-7	Gravelly loam----	SC, SC-SM, GC, GM-GC	A-4, A-6	0-5	70-80	60-75	55-70	35-50	25-35	5-15
	7-16	Gravelly clay, gravelly sandy clay	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	40-60	40-60	20-35
	16-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 17.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated.)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
100------------- Capay	0-20	40-60	1.30-1.50	0.06-0.2	0.14-0.16	5.6-8.4	0-2	High------	0.24	5	7	1-2
	20-60	40-60	1.35-1.50	0.06-0.2	0.14-0.16	6.6-8.4	0-2	High------	0.24			
101-------------- Capay	0-20	40-60	1.30-1.50	0.06-0.2	0.13-0.16	5.6-8.4	0-4	High------	0.24	5	7	1-2
	20-60	40-60	1.35-1.50	0.06-0.2	0.13-0.16	6.6-8.4	0-4	High------	0.24			
102-------------- Capay	0-20	40-60	1.30-1.50	0.06-0.2	0.14-0.16	5.6-8.4	0-2	High------	0.24	5	7	1-2
	20-35	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	0-2	High------	0.24			
	35-45	35-40	1.35-1.50	0.06-0.2	0.15-0.17	6.6-8.4	0-2	High------	0.28			
	45-60	10-20	1.45-1.55	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low-------	0.32			
106-------------- Capay	0-20	40-60	1.30-1.50	0.06-0.2	0.14-0.16	5.6-8.4	0-2	High------	0.24	5	7	1-2
	20-60	40-60	1.35-1.50	0.06-0.2	0.14-0.16	6.6-8.4	0-2	High------	0.24			
110-------------- El Solyo	0-17	30-40	1.45-1.55	0.2-0.6	0.17-0.20	6.6-7.8	0-2	Moderate	0.43	5	4	.5-2
	17-60	35-50	1.50-1.60	0.06-0.2	0.14-0.19	7.4-8.4	0-4	High------	0.37			
111-------------- El Solyo	0-17	30-40	1.45-1.55	0.2-0.6	0.17-0.20	6.6-7.8	0-2	Moderate	0.43	5	4	.5-2
	17-60	35-50	1.50-1.65	0.06-0.2	0.14-0.19	7.4-8.4	0-4	High------	0.37			
116-------------- El Solyo	0-17	30-40	1.45-1.55	0.2-0.6	0.17-0.20	6.6-7.8	0-2	Moderate	0.43	5	4	.5-2
	17-60	35-50	1.50-1.60	0.06-0.2	0.14-0.19	7.4-8.4	0-4	High------	0.37			
120:												
Vernalis--------	0-20	27-35	1.45-1.55	0.2-0.6	0.17-0.18	6.6-8.4	0-2	Moderate	0.32	5	6	1-2
	20-62	18-30	1.45-1.55	0.6-2.0	0.14-0.18	6.6-8.4	0-2	Moderate	0.37			
Zacharias-------	0-14	27-30	1.40-1.50	0.2-0.6	0.15-0.19	6.1-7.3	0-0	Moderate	0.37	5	6	1-2
	14-66	25-35	1.40-1.55	0.2-0.6	0.13-0.18	6.6-7.8	0-0	Moderate	0.37			
121, 122--------- Vernalis	0-20	18-27	1.55-1.65	0.6-2.0	0.14-0.17	6.6-8.4	0-2	Low-------	0.37	5	6	1-2
	20-62	18-30	1.45-1.55	0.6-2.0	0.14-0.18	6.6-8.4	0-2	Moderate	0.37			
123, 125--------- Vernalis	0-20	27-35	1.45-1.55	0.2-0.6	0.17-0.18	6.6-8.4	0-2	Moderate	0.32	5	6	1-2
	20-62	18-30	1.45-1.55	0.6-2.0	0.14 0.18	6.6-8.4	0-2	Moderate	0.37			
126:												
Vernalis--------	0-20	27-35	1.45-1.55	0.2-0.6	0.17-0.18	6.6-8.4	0-2	Moderate	0.32	5	6	1-2
	20-62	18-30	1.45-1.55	0.6-2.0	0.14-0.18	6.6-8.4	0-2	Moderate	0.37			
Zacharias-------	0-14	27-30	1.40-1.50	0.2-0.6	0.15-0.19	6.1-7.3	0-0	Moderate	0.37	5	6	1-2
	14-66	25-35	1.40-1.55	0.2-0.6	0.13-0.18	6.6-7.8	0-0	Moderate	0.37			
127-------------- Vernalis	0-20	18-27	1.55-1.65	0.6-2.0	0.14-0.17	6.6-8.4	0-2	Low-------	0.37	5	6	1-2
	20-62	18-30	1.45-1.55	0.6-2.0	0.14-0.18	6.6-8.4	0-2	Moderate	0.37			
130-------------- Stomar	0-20	27-35	1.40-1.55	0.2-0.6	0.16-0.18	6.6-7.3	0-0	Moderate	0.37	5	6	.5-2
	20-38	35-60	1.35-1.50	0.06-0.2	0.15-0.18	6.6-8.4	0-2	High------	0.32			
	38-60	27-40	1.40-1.55	0.2-0.6	0.16-0.18	7.4-8.4	0-2	Moderate	0.37			
131-------------- Stomar	0-20	27-35	1.40-1.55	0.2-0.6	0.17-0.19	6.6-7.3	0-0	Moderate	0.37	5	6	1-2
	20-38	35-60	1.35-1.50	0.06-0.2	0.12-0.15	6.6-8.4	0-2	High------	0.32			
	38-60	27-40	1.40-1.55	0.2-0.6	0.16-0.18	7.4-8.4	0-2	Moderate	0.37			
140-------------- Zacharias	0-14	27-30	1.40-1.50	0.2-0.6	0.15-0.19	6.1-7.3	0-0	Moderate	0.37	5	6	1-2
	14-66	25-35	1.40-1.55	0.2-0.6	0.13-0.18	6.6-7.8	0-0	Moderate	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
141 Zacharias	0-14	27-30	1.45-1.60	0.2-0.6	0.15-0.19	6.1-7.3	0-2	Moderate	0.37	5	6	1-2
	14-66	25-35	1.40-1.55	0.2-0.6	0.13-0.18	6.6-7.8	0-2	Moderate	0.37			
142, 144 Zacharias	0-14	27-35	1.45-1.60	0.2-0.6	0.10-0.15	6.1-7.3	0-0	Moderate	0.20	5	7	1-2
	14-66	25-35	1.40-1.55	0.2-0.6	0.10-0.14	6.6-7.8	0-0	Moderate	0.24			
145, 146 Zacharias	0-14	27-30	1.40-1.50	0.2-0.6	0.15-0.19	6.1-7.3	0-0	Moderate	0.37	5	6	1-2
	14-66	25-35	1.40-1.55	0.2-0.6	0.13-0.18	6.6-7.8	0-0	Moderate	0.37			
147 Zacharias	0-14	27-35	1.45-1.60	0.2-0.6	0.10-0.15	6.1-7.3	0-0	Moderate	0.20	5	7	1-2
	14-66	25-35	1.40-1.55	0.2-0.6	0.10-0.14	6.6-7.8	0-0	Moderate	0.24			
150 Columbia	0-14	10-18	1.50-1.60	2.0-6.0	0.12-0.14	6.1-7.8	0-0	Low	0.32	5	3	.5-2
	14-60	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32			
151:												
Columbia	0-14	10-18	1.50-1.60	2.0-6.0	0.12-0.14	6.1-7.8	0-0	Low	0.32	5	3	.5-2
	14-60	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32			
Columbia, sandy substratum	0-12	8-18	1.40-1.50	0.6-2.0	0.13-0.15	7.4-8.4	0-0	Low	0.49	4	3	1-2
	12-41	8-18	1.45-1.55	2.0-6.0	0.11-0.13	6.1-7.8	0-0	Low	0.32			
	41-60	0-5	1.60-1.70	6.0-20	0.05-0.08	6.1-7.8	0-0	Low	0.15			
153, 155 Columbia	0-14	10-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32	5	3	.5-2
	14-60	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32			
157:												
Columbia	0-14	10-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32	5	3	.5-2
	14-60	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32			
Columbia, sandy substratum	0-12	8-18	1.40-1.50	0.6-2.0	0.13-0.15	7.4-8.4	0-0	Low	0.49	4	3	1-2
	12-41	8-18	1.45-1.55	2.0-6.0	0.13-0.15	6.1-7.8	0-0	Low	0.32			
	41-60	0-5	1.60-1.70	6.0-20	0.05-0.08	6.1-7.8	0-0	Low	0.15			
159:												
Columbia	0-14	10-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32	5	3	.5-2
	14-60	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	0-0	Low	0.32			
Columbia, sandy substratum	0-12	8-18	1.40-1.50	0.6-2.0	0.13-0.15	7.4-8.4	0-0	Low	0.49	5	3	1-2
	12-41	8-18	1.45-1.55	2.0-6.0	0.11-0.13	6.1-7.8	0-0	Low	0.32			
	41-60	0-5	1.60-1.70	6.0-20	0.05-0.08	6.1-7.8	0-0	Low	0.15			
160 Merritt	0-12	27-35	1.35-1.50	0.2-0.6	0.17-0.19	6.6-8.4	0-0	Moderate	0.43	5	7	1-4
	12-38	20-30	1.35-1.55	0.2-0.6	0.15-0.19	7.9-8.4	0-0	Moderate	0.43			
	38-60	5-15	1.50-1.70	0.6-2.0	0.11-0.14	7.4-8.4	0-2	Low	0.32			
165 Merritt	0-12	27-35	1.35-1.50	0.2-0.6	0.17-0.19	6.6-8.4	0-0	Moderate	0.43	5	4L	1-4
	12-38	20-30	1.35-1.55	0.2-0.6	0.15-0.19	7.9-8.4	0-0	Moderate	0.43			
	38-60	5-15	1.50-1.70	0.6-2.0	0.11-0.14	7.4-8.4	0-2	Low	0.32			
170:												
Dospalos	0-26	40-60	1.35-1.45	0.2-0.6	0.10-0.15	7.4-8.4	0-4	Moderate	0.32	5	7	1-3
	26-44	35-60	1.20-1.35	0.06-0.2	0.09-0.14	7.9-8.4	0-4	High	0.32			
	44-60	30-60	1.20-1.45	0.06-0.2	0.09-0.14	7.9-8.4	0-4	High	0.32			
Bolfar	0-24	27-35	1.35-1.45	0.2-0.6	0.13-0.17	7.4-8.4	0-4	Moderate	0.37	5	6	1-2
	24-38	18-35	1.35-1.50	0.2-0.6	0.12-0.17	7.9-8.4	0-4	Moderate	0.37			
	38-60	18-35	1.35-1.50	0.2-0.6	0.12-0.16	7.9-8.4	0-4	Moderate	0.43			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
175:												
Dospalos--------	0-26	35-40	1.35 1.45	0.2-0.6	0.10-0.15	7.4-8.4	0-4	Moderate	0.32	5	7	1-3
	26-44	35-60	1.20-1.35	0.06-0.2	0.09-0.14	7.9-8.4	0-4	High------	0.32			
	44-60	30-60	1.20-1.45	0.06-0.2	0.09-0.14	7.9-8.4	0-4	High------	0.32			
Bolfar----------	0-24	27-35	1.35-1.45	0.2 0.6	0.13-0.17	7.4-8.4	0-4	Moderate	0.37	5	6	1-2
	24-38	18-35	1.35-1.50	0.2-0.6	0.12-0.17	7.9-8.4	0-4	Moderate	0.37			
	38-60	18-25	1.40-1.50	0.2-0.6	0.12-0.16	7.9-8.4	0-4	Moderate	0.43			
180-------------- Dello	0-10	8-15	1.60-1.70	2.0-6.0	0.12-0.14	6.6-8.4	0-2	Low--------	0.28	2	3	0-1
	10-60	0-10	1.60-1.70	6.0-20	0.06-0.09	6.6-8.4	0-2	Low --------	0.15			
190-------------- Clear Lake	0-16	40-60	1.30-1.45	0.06-0.2	0.12-0.16	5.6-7.3	0-0	High------	0.24	5	4	1-4
	16-60	40-60	1.25-1.40	0.06-0.2	0.12-0.16	7.4-8.4	0-4	High------	0.24			
195-------------- Clear Lake	0-16	40-60	1.30-1.45	0.06 0.2	0.12-0.16	5.6-7.3	0-0	High------	0.24	5	7	1-4
	16-60	40-60	1.25-1.40	0.06-0.2	0.12-0.16	7.4-8.4	0-4	High------	0.24			
200-------------- Veritas	0-21	5-16	1.55-1.65	2.0-6.0	0.12-0.15	7.4-8.4	0-4	Low--------	0.28	3	3	1-2
	21-41	5-16	1.50-1.60	2.0-6.0	0.12-0.15	7.4-8.4	0-4	Low--------	0.32			
	41-60	---	---	---	---	---	--	-----------	----			
210-------------- Cortina	0-6	10-25	1.45 1.60	2.0-6.0	0.07-0.14	5.6-8.4	0-0	Low-- ----	0.20	3	4	.5-1
	6-38	5-25	1.50-1.70	2.0-6.0	0.06-0.08	5.6-8.4	0-0	Low--------	0.10			
	38-60	0-10	1.60-1.70	6.0 20	0.03-0.05	5.6-8.4	0-0	Low--------	0.05			
215---- -------- Yokut	0-11	12-18	1.45-1.60	2.0-6.0	0.10 0.12	5.6-6.5	0-0	Low--------	0.24	3	3	.5-1
	11-19	15-25	1.45-1.60	0.6-2.0	0.15-0.17	5.6-6.5	0-0	Low--------	0.32			
	19-60	20-30	1.45-1.60	0.2-0.6	0.04-0.05	7.4 8.4	0-2	Moderate	0.10			
220:												
Xerofluvents----	0-20	---	---	---	---	---	0-2	- --------	----	4	5	---
	20-60	1-12	1.50 1.60	2.0-6.0	0.05-0.12	6.6-7.8	0-2	Low--------	0.10			
Xerorthents-----	0-4	5-12	1.45-1.55	2.0-6.0	0.10-0.15	---	0-2	Low------	0.10	5	4	0-1
	4-60	5-12	1.45-1.55	--	.07-.12	---	0-2	Low--------	0.10			
245:												
Bolfar ----------	0-24	18-27	1.40-1.50	0.6-2.0	0.12-0.15	7.4-8.4	0-4	Low--------	0.43	5	6	1-2
	24-38	18-35	1.35-1.50	0.2-0.6	0.12-0.17	7.9 8.4	0-4	Moderate	0.37			
	38-60	18-25	1.40-1.50	0.2-0.6	0.12-0.16	7.9-8.4	0-4	Moderate	0.43			
Columbia, sandy substratum-----	0-12	8-18	1.40-1.50	0.6-2.0	0.13-0.15	7.4-7.8	0-0	Low--------	0.49	4	3	1-2
	12-41	8-18	1.45-1.55	2.0-6.0	0.13-0.15	6.1-7.8	0-0	Low------	0.32			
	41-60	0-5	1.60-1.70	6.0-20	0.05-0.08	6.1-7.8	0-0	Low-- ----	0.15			
246:												
Bolfar----------	0-24	18-27	1.40-1.50	0.6-2.0	0.12 0.15	7.4-8.4	0-4	Low--------	0.43	5	6	1-2
	24-38	18-35	1.35-1.50	0.2-0.6	0.12-0.17	7.9-8.4	0-4	Moderate	0.37			
	38-60	18-35	1.35-1.50	0.2-0.6	0.12-0.16	7.9-8.4	0-4	Moderate	0.43			
Columbia, sandy substratum-----	0-12	8-18	1.40-1.50	0.6-2.0	0.13-0.15	7.4-7.8	0-0	Low--------	0.49	4	3	1-2
	12-41	8-18	1.45-1.55	2.0-6.0	0.11-0.13	6.1-7.8	0-0	Low--------	0.32			
	41-60	0-5	1.60-1.70	6.0-20	0.05-0.08	6.1-7.8	0-0	Low--------	0.15			
252, 253:												
Chaqua----------	0-18	22-27	1.40-1.50	0.6-2.0	0.14-0.16	7.4-8.4	0-0	Low-- ---	0.37	4	4L	.5-1
	18-41	18-30	1.40-1.50	0.2-0.6	0.14-0.17	7.4-8.4	0-0	Moderate	0.37			
	41-45	---	---	---	---	---	---	-----------	----			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
252, 253:												
Arburua	0-6	18-27	1.45-1.55	0.6 2.0	0.13-0.16	7.4-8.4	0-2	Low	0.37	2	6	0-1
	6-22	18-30	1.40-1.55	0.6-2.0	0.12-0.18	7.9-8.4	0-2	Moderate	0.37			
	22-24	---	---	---	---	---	---	---	---			
	24-28	---	---	---	---	---	---	---	---			
255:												
Calla	0-11	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	0-0	Moderate	0.32	5	4L	.5-1
	11-30	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	0-2	Moderate	0.32			
	30-60	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	0-2	Moderate	0.32			
Carbona	0-15	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	0-4	Moderate	0.28	5	7	2-5
	15-24	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.4-8.4	0-4	High	0.32			
	24-50	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.9-8.4	0-4	High	0.32			
	50-60	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	0-4	Moderate	0.32			
270 Elsalado	0-6	8-18	1.55-1.65	2.0-6.0	0.13-0.15	7.4-8.4	0-2	Low	0.37	5	3	.5-1
	6-26	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
	26-60	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
271, 272 Elsalado	0-6	8-18	1.45-1.60	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43	5	5	.5-1
	6-26	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
	26-60	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
273 Elsalado	0-6	8-18	1.55-1.65	2.0 6.0	0.13-0.15	7.4-8.4	0-2	Low	0.37	5	3	.5-1
	6-26	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
	26-60	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
274 Elsalado	0-6	8-18	1.45-1.60	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43	5	5	.5-1
	6-26	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
	26-60	8-18	1.45-1.65	0.6-2.0	0.14-0.16	7.4-8.4	0-2	Low	0.43			
281 Carbona	0-15	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	0-4	Moderate	0.28	5	7	2-5
	15-24	35-45	1.30-1.50	0.06 0.2	0.13 0.18	7.4-8.4	0-4	High	0.32			
	24-50	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.9-8.4	0-4	High	0.32			
	50-60	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	0-4	Moderate	0.32			
290 , 291:												
Carbona	0-15	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	0-4	Moderate	0.28	5	7	2-5
	15-24	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.4-8.4	0-4	High	0.32			
	24-50	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.9-8.4	0-4	High	0.32			
	50-60	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	0-4	Moderate	0.32			
Orognen	0-11	27-35	1.40-1.55	0.2-0.6	0.12-0.15	6.6-7.8	0-0	Moderate	0.24	3	7	.5-1
	11-40	38-55	1.35-1.50	0.01-0.06	0.10-0.12	7.4-8.4	0-2	High	0.20			
	40-60	35-60	1.35-1.50	0.01-0.06	0.06-0.08	7.4-8.4	0-2	High	0.24			
300, 301 Damluis	0-22	35-40	1.30-1.40	0.2-0.6	0.17-0.20	7.4-8.4	0-0	High	0.32	4	7	1-3
	22-30	45-55	1.30-1.40	0.06-0.2	0.15-0.17	7.9-8.4	0-0	High	0.28			
	30-40	28-40	1.30-1.45	0.2-0.6	0.16-0.17	7.9-8.4	0-2	Moderate	0.32			
	40-60	15-25	1.45-1.60	0.2-0.6	0.05-0.06	7.9-8.4	0-2	Low	0.10			
302, 303, 304 Damluis	0-20	35-40	1.30-1.40	0.2-0.6	0.15-0.16	7.4-8.4	0-0	High	0.20	5	7	1-3
	20-48	45-55	1.30-1.40	0.06-0.2	0.12-0.14	7.9-8.4	0-0	High	0.20			
	48-58	28-40	1.30-1.45	0.2-0.6	0.14-0.16	7.9-8.4	0-2	Moderate	0.15			
	58-60	15-25	1.45-1.60	0.2-0.6	0.05-0.06	7.9-8.4	0-2	Low	0.10			
310 Deldota	0-18	40-50	1.30-1.45	0.06-0.2	0.15-0.16	7.4-8.4	0-2	High	0.28	5	7	1-3
	18-23	35-50	1.30-1.40	0.06-0.2	0.15-0.17	7.4-8.4	0-2	High	0.28			
	23-60	30-40	1.30-1.50	0.06-0.2	0.16-0.18	7.4-8.4	0-2	Moderate	0.24			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
320-------------- Dosamigos	0-15	35-40	1.35-1.45	0.06-0.2	0.17-0.20	7.9-8.4	0-2	Moderate	0.28	5	4	1-2
	15-42	37-50	1.25-1.40	0.01-0.06	0.12-0.17	7.9-8.4	2-8	High	0.28			
	42-60	30-45	1.30-1.50	0.06-0.2	0.09-0.16	7.9-8.4	2-16	Moderate	0.32			
330, 331--------- Pedcat	0-7	27-38	1.35-1.45	0.2-0.6	0.10-0.16	6.6-7.8	0-2	Moderate	0.37	2	4	.5-1
	7-25	40-50	1.35-1.45	0.01-0.06	0.09-0.13	7.9-8.4	0-4	High------	0.32			
	25-51	30-45	1.35-1.45	0.06-0.2	0.09-0.12	7.9-9.0	8-16	High------	0.32			
	51-60	30-45	1.40-1.50	0.06-0.2	0.09-0.12	7.9-9.0	0-4	High------	0.32			
340:												
Carranza--------	0-10	27-35	1.35-1.45	0.6-2.0	0.14-0.17	6.6-7.3	0-0	Moderate	0.20	3	7	1-2
	10-38	25-35	1.35-1.50	0.6-2.0	0.13-0.15	6.6-7.8	0-0	Moderate	0.20			
	38-60	5-15	1.50-1.70	6.0-20	0.01-0.03	6.6-7.8	0-0	Low-------	0.10			
Woo-------------	0-19	27-35	---	0.2-0.6	0.15-0.19	6.6-8.4	0-0	Moderate	0.32	5	7	1-2
	19-41	18-35	---	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.32			
	41-62	5-15	---	2.0-6.0	0.06-0.08	7.4-8.4	<2	Low-------	0.20			
350-------------- Woo	0-16	18-27	---	0.6-2.0	0.14-0.17	6.6-8.4	0-0	Low-------	0.37	5	4L	1-2
	16-67	18-35	---	0.2-0.6	0.14-0.19	7.4-8.4	<2	Moderate	0.32			
400, 401:												
Alo ------------	0-12	40-55	1.25-1.45	0.06-0.2	0.14-0.16	6.1-7.8	0-2	High------	0.24	3	7	1-3
	12-35	35-55	1.20-1.35	0.06-0.2	0.14-0.17	6.6-8.4	0-2	High------	0.24			
	35-39	---	---	---			---	----------	----			
Vaquero---------	0-6	40-60	1.35-1.50	0.06-0.2	0.13-0.16	6.6-8.4	0-2	Very high	0.20	3	7	.5-2
	6-35	40-60	1.35-1.50	0.06-0.2	0.09-0.17	7.4-9.0	2-16	Very high	0.28			
	35-39	---	---	---	---	---	---	----------	----			
410-------------- Ayar	0-15	40-50	1.25-1.40	0.06-0.2	0.14-0.17	7.4-8.4	0-2	High------	0.28	4	7	1-3
	15-26	40-50	1.30-1.40	0.06-0.2	0.14-0.17	7.4-8.4	0-2	High------	0.28			
	26-47	40-50	1.20-1.35	0.06-0.2	0.14-0.17	7.4-8.4	0-2	High------	0.28			
	47-51	---	---	---	---	---	---	----------	----			
420:												
Ayar------------	0-15	40-50	1.25-1.40	0.06-0.2	0.14-0.17	7.4-8.4	0-2	High------	0.28	4	7	1-3
	15-26	40-50	1.30-1.40	0.06-0.2	0.14-0.17	7.4-8.4	0-2	High------	0.28			
	26-47	40-50	1.20-1.35	0.06-0.2	0.14-0.17	7.4-8.4	0-2	High------	0.28			
	47-51	---	---	---	---	---	---	----------	----			
Oneil-----------	0-14	20-27	1.45-1.55	0.6-2.0	0.15-0.18	7.9-8.4	0-0	Low-------	0.43	2	6	1-3
	14-30	20-35	1.45-1.55	0.2-0.6	0.14-0.20	7.9-8.4	0-0	Moderate	0.49			
	30-34	---	---	---	---	---	---	----------	----			
500, 501:												
Arburua---------	0-6	18-27	1.45-1.55	0.6-2.0	0.13-0.16	7.4-8.4	0-2	Low-------	0.37	2	6	0-1
	6-22	18-30	1.40-1.55	0.6-2.0	0.12-0.18	7.9-8.4	0-2	Moderate	0.37			
	22-24	---	---	---	---	---	---	----------	----			
	24-28	---	---	---	---	---	---	----------	----			
San Timoteo-----	0-5	8-18	1.50-1.60	2.0-6.0	0.11-0.14	7.4-8.4	0-2	Low-------	0.24	3	3	.5-1
	5-22	8-18	1.50-1.60	2.0-6.0	0.11-0.15	7.9-8.4	0-2	Low-------	0.24			
	22-26	---	---	---	---	---	---	----------	----			
502:												
Arburua---------	0-6	18-27	1.45-1.55	0.6-2.0	0.13-0.16	7.4-8.4	0-2	Low-------	0.37	2	6	0-1
	6-22	18-30	1.40-1.55	0.6-2.0	0.12-0.18	7.9-8.4	0-2	Moderate	0.37			
	22-24	---	---	---	---	---	---	----------	----			
	24-28	---	---	---	---	---	---	----------	----			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
502:												
Wisflat	0-5	7-18	1.50-1.60	2.0-6.0	0.10-0.13	7.4-8.4	0-2	Low	0.24	1	3	0-.1
	5-10	5-18	1.50-1.60	2.0-6.0	0.09-0.15	7.4-8.4	0-2	Low	0.24			
	10-13	---	---	---	---	---	---	----------	----			
	13-17	---	---	---	---	---	---	----------	----			
505, 506:												
Arburua	0-6	18-27	1.45-1.55	0.6-2.0	0.13-0.16	7.4-8.4	0-2	Low	0.37	2	6	0-1
	6-22	18-30	1.40-1.55	0.6-2.0	0.12-0.18	7.9-8.4	0-2	Moderate	0.37			
	22-24	---	---	---	---	---	---	----------	----			
	24-28	---	---	---	---	---	---	----------	----			
Contra Costa	0-9	27-35	1.40-1.50	0.6-2.0	0.14-0.16	5.6-7.3	0-0	Moderate	0.32	2	6	.5-1
	9-38	35-45	1.30-1.45	0.06-0.2	0.15-0.17	5.6-7.3	0-0	High	0.28			
	38-42	---	---	---	---	---	---	----------	----			
Wisflat	0-5	7-18	1.50-1.60	2.0-6.0	0.10-0.13	7.4-8.4	0-2	Low	0.24	1	3	0-.1
	5-10	5-18	1.50-1.60	2.0-6.0	0.09-0.15	7.4-8.4	0-2	Low	0.24			
	10-13	---	---	---	---	---	---	----------	----			
	13-17	---	---	---	---	---	---	----------	----			
510:												
Arburua	0-6	18-27	1.45-1.55	0.6-2.0	0.13-0.16	7.4-8.4	0-2	Low	0.37	2	6	0-1
	6-22	18-30	1.40-1.55	0.6-2.0	0.12-0.18	7.9-8.4	0-2	Moderate	0.37			
	22-24	---	---	---	---	---	---	----------	----			
	24-28	---	---	---	---	---	---	----------	----			
Wisflat	0-5	7-18	1.50-1.60	2.0-6.0	0.10-0.13	7.4-8.4	0-2	Low	0.24	1	3	0-.1
	5-10	5-18	1.50-1.60	2.0-6.0	0.09-0.15	7.4-8.4	0-2	Low	0.24			
	10-13	---	---	---	---	---	---	----------	----			
	13-17	---	---	---	---	---	---	----------	----			
Rock outcrop	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	---
520, 521:												
Wisflat	0-5	7-18	1.50-1.60	2.0-6.0	0.10-0.13	7.4-8.4	0-2	Low	0.24	1	3	0-.1
	5-10	5-18	1.50-1.60	2.0-6.0	0.09-0.15	7.4-8.4	0-2	Low	0.24			
	10-13	---	---	---	---	---	---	----------	----			
	13-17	---	---	---	---	---	---	----------	----			
Rock outcrop	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	---
530 Oneil	0-14	20-27	1.45-1.55	0.6-2.0	0.15-0.18	7.9-8.4	0-0	Low	0.43	2	6	1-3
	14-30	20-35	1.45-1.55	0.2-0.6	0.14-0.20	7.9-8.4	0-0	Moderate	0.49			
	30-34	---	---	---	---	---	---	----------	----			
540 Oquin	0-24	12-18	1.50-1.60	2.0-6.0	0.13-0.15	7.4-8.4	0-2	Low	0.32	3	3	1-3
	24-31	12-18	1.45-1.55	2.0-6.0	0.11-0.14	7.4-8.4	0-2	Low	0.37			
	31-35	---	---	---	---	---	---	----------	----			
600, 601:												
Gonzaga	0-18	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	0-0	Low	0.32	2	5	1-5
	18-29	15-27	1.45-1.55	0.2-0.6	0.11-0.14	6.6-7.3	0-0	Moderate	0.20			
	29-38	35-55	1.35-1.50	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High	0.15			
	38-42	---	---	---	---	---	---	----------	----			
Honker	0-7	10-20	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.3	0-0	Low	0.24	2	3	1-3
	7-16	20-35	1.40-1.55	0.2-0.6	0.15-0.18	6.1-7.3	0-0	Moderate	0.32			
	16-36	35-55	1.35-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High	0.15			
	36-40	---	---	---	---	---	---	----------	----			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
600, 601:												
Franciscan------	0-14	10-20	1.50-1.60	2.0-6.0	0.09-0.12	6.1-7.3	0-2	Low--------	0.24	2	3	2-3
	14-29	20-35	1.40-1.55	0.2-0.6	0.12-0.16	6.1-7.3	0-2	Moderate	0.20			
	29-33	---	---	---	---	---	---	----------	----			
610, 611:												
Honker----------	0-7	10-20	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.3	0-0	Low--------	0.24	2	3	1-3
	7-16	20-35	1.40-1.55	0.2-0.6	0.15-0.18	6.1-7.3	0-0	Moderate	0.32			
	16-36	35-55	1.35-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.15			
	36-40	---	---	---	---	---	---	----------	----			
Vallecitos------	0-7	15-27	1.45-1.55	0.6-2.0	0.11-0.13	6.6-7.3	0-0	Low--------	0.24	1	6	1-2
	7-16	35-50	1.35-1.50	0.06-0.2	0.09-0.11	6.6-7.3	0-0	High------	0.20			
	16-20	---	---	---	---	---	---	----------	----			
Honker, eroded--	0-4	15-27	1.45-1.55	0.2-0.6	0.11-0.14	6.6-7.3	0-0	Moderate	0.20	2	6	1-3
	4-29	40-55	1.35-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.15			
	29-33	---	---	---	---	---	---	----------	----			
612:												
Honker----------	0-7	10-20	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.3	0-0	Low--------	0.24	2	3	1-3
	7-16	20-35	1.40-1.55	0.2-0.6	0.15-0.18	6.1-7.3	0-0	Moderate	0.32			
	16-36	35-55	1.35-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.15			
	36-40	---	---	---	---	---	---	----------	----			
Vallecitos------	0-7	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-6.5	0-0	Low--------	0.37	1	5	1-2
	7-16	35-50	1.35 1.50	0.06-0.2	0.14-0.16	6.6-7.3	0-2	High------	0.24			
	16-20	---	---	---	---	---	---	---	----			
Gonzaga---------	0-18	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	0-0	Low--------	0.32	2	5	1-5
	18-29	15-30	1.40-1.55	0.2-0.6	0.14-0.18	6.6-7.3	0-0	Moderate	0.32			
	29-38	35-55	1.35-1.50	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.28			
	38-42	---	---	---	---	---	---	----------	----			
613, 614:												
Honker----------	0-5	15-27	1.45-1.55	0.2 0.6	0.11-0.14	6.6-7.3	0-0	Moderate	0.20	2	6	1 3
	5-20	20-35	1.40-1.55	0.2-0.6	0.11 0.14	6.6 7.3	0 0	Moderate	0.20			
	20-36	40-55	1.35-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.15			
	36-40	---	---	---	---	---	---	----------	----			
Gaviota---------	0-10	10-18	1.40-1.55	2.0-6.0	0.11-0.13	5.6-7.3	0-0	Low--------	0.24	1	6	0-1
	10-14	---	---	---	---	---	---	----------	----			
615:												
Honker----------	0-7	10-20	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.3	0-0	Low--------	0.24	2	3	1-3
	7-16	20-35	1.40-1.55	0.2-0.6	0.15-0.18	6.1-7.3	0-0	Moderate	0.32			
	16-36	35-55	1.35 1.55	0.01 0.06	0.06-0.08	6.6-7.8	0-0	High------	0.15			
	36-40	---	---	---	---	---	---	----------	----			
Quinto----------	0-6	10-20	1.50-1.60	2.0-6.0	0.09-0.11	6.1-7.3	0-0	Low--------	0.20	1	4	1-3
	6-17	20-35	1.45-1.55	0.2-0.6	0.10-0.13	6.1-7.8	0-0	Moderate	0.20			
	17-19	---	---	---	---	---	---	----------	----			
620-------------- Franciscan	0-10	10-20	1.50-1.60	2.0-6.0	0.09-0.12	6.1-7.3	0-0	Low--------	0.24	2	3	2-4
	10-26	20-35	1.40-1.55	0.2-0.6	0.12-0.16	6.1-7.3	0-0	Moderate	0.32			
	26-38	20-35	1.40-1.55	0.2-0.6	0.10-0.14	6.1-7.3	0-0	Moderate	0.20			
	38-40	---	---	---	---	---	---	----------	----			
625:												
Franciscan------	0-10	10-20	1.50-1.60	2.0-6.0	0.09 0.12	6.1 7.3	0-0	Low--------	0.24	2	3	2-4
	10-26	20-35	1.40-1.55	0.2-0.6	0.12-0.16	6.1-7.3	0-0	Moderate	0.32			
	26-38	20-35	1.40-1.55	0.2-0.6	0.10-0.14	6.1-7.3	0-0	Moderate	0.20			
	38-40	---	---	---	---	---	---	----------	----			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
625:												
Quinto----------	0-6	10-20	1.50-1.60	2.0-6.0	0.09-0.11	6.1-7.3	0-0	Low-------	0.20	1	4	1-3
	6-17	20-35	1.45-1.55	0.2-0.6	0.10-0.13	6.1-7.8	0-0	Moderate	0.20			
	17-18	---	---	---	---	---	---	----------	----			
Honker----------	0-7	10-20	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.3	0-0	Low-------	0.24	2	3	1-3
	7-16	20-35	1.40-1.55	0.2-0.6	0.15-0.18	6.1-7.3	0-0	Moderate	0.32			
	16-36	35-55	1.35-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.15			
	36-40	---	---	---	---	---	---	----------	----			
630, 631:												
Millsholm-------	0-19	20-27	1.45-1.50	0.6-2.0	0.14-0.17	5.6-7.3	0-0	Low-------	0.37	1	6	.5-3
	19-23	---	---	---	---	---	---	----------	----			
Honker----------	0-7	10-20	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.3	0-0	Low-------	0.24	2	3	1-3
	7-16	20-35	1.40-1.55	0.2-0.6	0.15-0.18	6.1-7.3	0-0	Moderate	0.32			
	16-36	35-55	1.35-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.15			
	36-40	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	---
635-------------- Millsholm	0-19	20-27	1.45-1.50	0.6-2.0	0.14-0.17	5.6-7.3	0-0	Low-------	0.37	1	6	.5-3
	19-23	---	---	---	---	---	---	----------	----			
640:												
Quinto----------	0-6	10-20	1.50-1.60	2.0-6.0	0.09-0.11	6.1-7.3	0-0	Low-------	0.20	1	4	1-3
	6-17	20-35	1.45-1.55	0.2-0.6	0.10-0.13	6.1-7.8	0-0	Moderate	0.20			
	17-19	---	---	---	---	---	---	----------	----			
Millsholm-------	0-19	20-27	1.45-1.50	0.6-2.0	0.14-0.17	5.6-7.3	0-0	Low-------	0.37	1	6	.5-3
	19-23	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	--
650:												
Quinto----------	0-6	10-20	1.50-1.60	2.0-6.0	0.09-0.11	6.1-7.3	0-0	Low-------	0.20	1	4	1-3
	6-17	20-35	1.45-1.55	0.2-0.6	0.10-0.13	6.1-7.8	0-0	Moderate	0.20			
	17-19	---	---	---	---	---		----------	----			
Rock outcrop----	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	---
660-------------- Gaviota	0-10	10-18	1.45-1.55	2.0-6.0	0.12-0.15	5.6-7.3	0-0	Low-------	0.37	1	5	0-1
	10-14	---	---	---	---	---	---	----------	----			
661-------------- Gaviota	0-10	10-18	1.40-1.55	2.0-6.0	0.11-0.13	5.6-7.3	0-0	Low-------	0.24	1	6	0-1
	10-14	---	---	---	---	---	---	----------	----			
682:												
Henneke---------	0 5	20-40	1.25-1.35	0.6-2.0	0.08-0.12	6.6-7.8	---	Moderate	0.20	1	7	2-7
	5-9	30-40	1.40-1.50	0.2-0.6	0.09-0.12	6.6-7.8	---	Moderate	0.20			
	9-19	35 55	1.35-1.45	0.2-0.6	0.06-0.09	6.6-7.8	0-2	Moderate	0.15			
	19-23	---	---	---	---	---	---	----------	----			
Hentine---------	0-4	20-27	1.25-1.35	0.6-2.0	0.09-0.13	6.6-7.8	0-0	Low--------	0.24	1	6	2-5
	4-17	25-35	1.35-1.45	0.2-6.0	0.10-0.15	7.4-8.4	0-0	Low -------	0.17			
	17-21	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	---

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
683:												
Hentine---------	0-4	20-27	1.25-1.35	0.6-2.0	0.09 0.13	6.6 7.8	0-0	Low-------	0.24	1	6	2-5
	4-17	25-35	1.35-1.45	0.2-6.0	0.10-0.15	7.4-8.4	0-0	Low-------	0.17			
	17 21	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	---
Henneke---------	0-5	20-40	1.25-1.35	0.6-2.0	0.08-0.12	6.6-7.8	---	Moderate	0.20	1	7	2-7
	5-9	30-40	1.40-1.50	0.2-0.6	0.09-0.12	6.6-7.8	---	Moderate	0.20			
	9-19	35-55	1.35-1.45	0.2-0.6	0.06-0.09	6.6-7.8	0-2	Moderate	0.15			
	19-23	---	---	---	---	---	---	----------	---			
684:												
Hentine---------	0-4	20-27	1.15-1.25	0.6-2.0	0.09-0.13	6.6 7.8	0-0	Low-------	0.20	1	6	2-5
	4-14	25-35	1.30-1.45	0.2-6.0	0.10-0.15	7.4-8.4	0-0	Low-------	0.17			
	14-18	---	---	---	---	---	---	----------	----			
Henneke---------	0-5	20-40	1.25-1.35	0.6-2.0	0.08-0.12	6.6-7.8	---	Moderate	0.20	1	7	2-7
	5-9	30-40	1.40-1.50	0.2-0.6	0.09-0.12	6.6-7.8	---	Moderate	0.20			
	9-19	35-55	1.35-1.45	0.2-0.6	0.06-0.09	6.6-7.8	0-2	Moderate	0.15			
	19-23	---	---	---	---	---	---	----------	----			
685:												
Stonyford-------	0-6	20-27	---	0.6-2.0	0.12-0.14	5.6-7.3	0-0	Low-------	0.24	1	6	.5-2
	6-17	27-35	---	0.2-0.6	0.13 0.16	5.6-7.3	0 0	Moderate	0.24			
	17-21	---	---	---	---	---	---	----------	----			
Stonyford-------	0-6	20-27	---	0.6-2.0	0.12-0.14	5.6-7.3	0-0	Low-------	0.24	1	6	.5-2
	6-17	27-35	---	0.2-0.6	0.13-0.16	5.6-7.3	0-0	Moderate	0.24			
	17-21	---	---	---	---	---	---	----------	----			
687:												
Hentine---------	0-4	20-27	1.15-1.25	0.6-2.0	0.09-0.13	6.6-7.8	0-0	Low-------	0.20	1	6	2-5
	4-14	25-35	1.30-1.45	0.2-6.0	0.10-0.15	7.4-8.4	0-0	Low-------	0.17			
	14-18	---	---	---	---	---	---	----------	----			
Henneke---------	0-5	20-40	1.25-1.35	0.6-2.0	0.08-0.12	6.6-7.8	---	Moderate	0.20	1	7	2-7
	5-9	30-40	1.40-1.50	0.2-0.6	0.09-0.12	6.6-7.8	---	Moderate	0.20			
	9-19	35-55	1.35-1.45	0.2-0.6	0.06-0.09	6.6-7.8	0-2	Moderate	0.15			
	19-23	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	0.06-6.0	---	---	---	----------	----	---	8	---
690:												
Sehorn----------	0-7	40-50	1.35-1.45	0.06-0.2	0.14-0.16	6.1-7.3	0-0	High------	0.28	2	4	1-3
	7-26	40-50	1.35-1.45	0.06-0.2	0.14-0.16	6.6-8.4	0-2	High------	0.28			
	26-30	---	---	---	---	---	---	----------	----			
Contra Costa----	0-9	27-35	1.40-1.50	0.6-2.0	0.14-0.16	5.6-7.3	0-0	Moderate	0.32	2	6	.5-1
	9-38	35-45	1.30-1.45	0.06-0.2	0.15-0.17	5.6-7.3	0-0	High------	0.28			
	38-42	---	---	---	---	---	---	----------	----			
695-------------- Orognen	0-5	10-20	1.50-1.60	2.0-6.0	0.10-0.13	6.1-7.8	0-1	Low-------	0.24	3	3	.5-1
	5-19	15-25	1.45-1.55	0.2-2.0	0.14-0.18	6.6-7.8	0-1	Moderate	0.28			
	19-47	35-60	1.35-1.40	0.01-0.06	0.12-0.16	6.6-8.4	0-2	High------	0.24			
	47-60	30-40	1.35-1.40	0.2-0.6	0.09-0.15	7.4-8.4	0-2	Moderate	0.20			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
700:												
Hytop-----------	0-11	15-25	1.45-1.55	0.6-2.0	0.13-0.16	6.6-7.8	0-0	Low--------	0.37	3	5	1-3
	11-39	35-55	1.40-1.55	0.01-0.06	0.06-0.08	6.6-7.8	0-0	High------	0.32			
	39-43	---	---	---	---	---	---	-----------	----			
Franciscan------	0-10	10-20	1.50-1.60	2.0-6.0	0.09-0.12	6.1-7.3	0-0	Low--------	0.24	2	3	2-4
	10-26	20-35	1.40-1.55	0.2-0.6	0.12-0.16	6.1-7.3	0-0	Moderate	0.32			
	26-38	20-35	1.40-1.55	0.2-0.6	0.10-0.14	6.1-7.3	0-0	Moderate	0.20			
	38-40	---	---	---	--	---	---	-----------	----			
Vallecitos------	0-7	15-27	1.45-1.55	0.6-2.0	0.11-0.13	6.6-7.3	0-0	Low--------	0.24	1	6	1-2
	7-16	35-50	1.35-1.50	0.06-0.2	0.09-0.11	6.6-7.3	0-0	High------	0.20			
	16-20	---	---	---	---	---	---	-----------	----			

Table 18.--Water Features

("Flooding," "water table," and such terms as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth (Ft)	High water table: Kind	High water table: Months
100: Capay	D	None	---	---	>6.0		---
101: Capay	D	None	---	---	4.0-6.0	Apparent	Jan-Dec
102: Capay	D	None	---	---	>6.0	---	---
106: Capay	D	Rare	---	---	>6.0	---	---
110: El Solyo	C	None	---	---	>6.0	---	---
111: El Solyo	C	None	---	---	4.0-6.0	Apparent	Dec-Mar
116: El Solyo	C	Rare	---	---	>6.0	---	---
120:							
Vernalis	B	None	---	---	>6.0	---	---
Zacharias	B	None	---	---	>6.0	---	---
121: Vernalis	B	None	---	---	4.0-6.0	Apparent	Jan-Dec
122: Vernalis	B	None	---	---	>6.0	---	---
123: Vernalis	B	None	---	---	4.0-6.0	Apparent	Jan-Dec
125: Vernalis	B	None	---	---	>6.0	---	---
126:							
Vernalis	B	Rare	---	---	>6.0	---	---
Zacharias	B	Rare	---	---	>6.0	---	---
127: Vernalis	B	Rare	---	---	>6.0	---	---
130: Stomar	C	None	---	---	>6.0	---	---
131: Stomar	C	None	---	---	4.0-6.0	Apparent	Jan-Dec
140: Zacharias	B	None	---	---	>6.0	---	---
141: Zacharias	B	None	---	---	4.0-6.0	Apparent	Dec-Mar

Table 18.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
142, 144, 145----------- Zacharias	B	None------------	---	---	>6.0	---	---
146, 147-------------- Zacharias	B	Rare------------	---	---	>6.0	---	---
150--------------------- Columbia	C	Occasional-	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
151:							
Columbia---------------	C	Occasional------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
Columbia, sandy substratum------------	C	Occasional------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
153--------------------- Columbia	C	Frequent--------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
155--------------------- Columbia	C	Rare------------	---	---	3.0-5.0	Apparent	Dec-Apr
157:							
Columbia---------------	C	Rare------------	---	---	3.0-5.0	Apparent	Dec-Apr
Columbia, sandy substratum------------	C	Rare------------	---	---	3.0-5.0	Apparent	Dec-Apr
159:							
Columbia---------------	C	Frequent--------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
Columbia, sandy substratum------------	C	Frequent--------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
160--------------------- Merritt	B	Occasional------	Brief to long	Dec-Apr	4.0-6.0	Apparent	Dec-Apr
165--------------------- Merritt	B	Rare------------	---	---	4.0-6.0	Apparent	Dec-Apr
170:							
Dospalos---------------	D	Occasional------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
Bolfar-----------------	D	Occasional------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
175:							
Dospalos---------------	D	Rare------------	---	---	3.0-5.0	Apparent	Dec-Apr
Bolfar-----------------	D	Rare------------	---	---	3.0-5.0	Apparent	Dec-Apr
180--------------------- Dello	C	Frequent--------	Brief to long	Dec Apr	3.0-4.0	Apparent	Dec-Apr
190 ------------------- Clear Lake	D	Occasional------	Brief to long	Dec-Apr	3.0-6.0	Apparent	Dec-Apr
195--------------------- Clear Lake	D	Rare------------	---	---	3.0-6.0	Apparent	Dec-Apr
200--------------------- Veritas	B	Rare------------	---	---	>6.0	---	---
210--------------------- Cortina	B	Rare------------	---	---	>6.0	---	---

Table 18.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
215: Yokut	B	None	---	---	>6.0	---	---
220:							
Xerofluvents	A	Occasional	Brief to long	Dec-Apr	>6.0	---	---
Xerorthents	A	Rare	---	---	>6.0	---	---
245:							
Bolfar	D	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
Columbia, sandy substratum	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
246:							
Bolfar	D	Occasional	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
Columbia, sandy substratum	C	Occasional	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Apr
252, 253:							
Chaqua	B	None	---	---	>6.0	---	---
Arburua	C	None	---	---	>6.0	---	---
255:							
Calla	B	None	---	---	>6.0	---	---
Carbona	D	None	---	---	>6.0	---	---
270, 271: Elsalado	B	Rare	---	---	>6.0	---	---
272: Elsalado	B	None	---	---	4.0-6.0	Apparent	Dec-Mar
273, 274: Elsalado	B	None	---	---	>6.0	---	---
281: Carbona	D	None	---	---	>6.0	---	---
290, 291:							
Carbona	D	None	---	---	>6.0	-	---
Orognen	D	None	---	---	>6.0	---	---
300, 301, 302, 303, 304: Damluis	C	None	---	---	>6.0	---	---
310: Deldota	D	None	---	---	3.5-5.0	Perched	Dec-Mar
320: Dosamigos	D	None	---		3.5-5.0	Perched	Dec-Mar
330: Pedcat	D	Rare	---	---	3.5-5.0	Apparent	Dec-Mar
331: Pedcat	D	None	---	---	3.5-5.0	Apparent	Dec-Mar

Table 18.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
340:							
Carranza	B	None	---	---	>6.0	---	---
Woo	B	None	---	---	>6.0	---	---
350 Woo	B	None	---	---	>6.0	---	---
400, 401:							
Alo	D	None		---	>6.0	---	---
Vaquero	D	None	---	---	>6.0	---	---
410 Ayar	D	None	---	---	>6.0	---	---
420:							
Ayar	D	None	---	---	>6.0	---	---
Oneil	C	None	---	---	>6.0	---	---
430:							
Vaquero	D	None	---	---	>6.0	---	---
Carbona	D	None	---	---	>6.0	---	---
500, 501:							
Wisflat	D	None	---	---	>6.0	---	---
Arburua	C	None	---	---	>6.0	---	---
San Timoteo	B	None	---	---	>6.0	---	---
502:							
Arburua	C	None	---	---	>6.0	---	---
Wisflat	D	None	---	---	>6.0	---	---
505, 506:							
Arburua	C	None	---	---	>6.0	---	---
Contra Costa	C	None	---	---	>6.0	---	---
Wisflat	D	None	---	---	>6.0	---	---
510:							
Arburua	C	None	---	---	>6.0	---	---
Wisflat	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
520, 521:							
Wisflat	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
530 Oneil	C	None		---	>6.0	---	---
540 Oquin	C	None	---	---	>6.0	---	---

Table 18.--Water Features --Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
600, 601:							
Gonzaga	D	None	---	---	>6.0	---	---
Honker	D	None	---	---	>6.0	---	---
Franciscan	C	None	---	---	>6.0	---	---
610, 611:							
Honker	D	None	---	---	>6.0	---	---
Vallecitos	D	None	---	---	>6.0	---	---
Honker, eroded	D	None	---	---	>6.0	---	---
612:							
Honker	D	None	---	---	>6.0	---	---
Vallecitos	D	None	---	---	>6.0	---	---
Gonzaga	D	None	---	---	>6.0	---	---
613, 614:							
Honker	D	None	---	---	>6.0	---	---
Gaviota	D	None	---	---	>6.0	---	---
615:							
Honker	D	None	---	---	>6.0	---	---
Quinto	D	None	---	---	>6.0	---	---
620 Franciscan	C	None	---	---	>6.0	---	---
625:							
Franciscan	C	None	---	---	>6.0	---	---
Quinto	D	None	---	---	>6.0	---	---
Honker	D	None	---	---	>6.0	---	---
630, 631:							
Millsholm	D	None	---	---	>6.0	---	---
Honker	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
635 Millsholm	D	None	---	---	>6.0	---	---
640:							
Quinto	D	None	---	---	>6.0	---	---
Millsholm	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
650:							
Quinto	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---

Table 18.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
660, 661: Gaviota	D	None	---	---	>6.0	---	---
682:							
Henneke	D	None	---	---	>6.0	---	---
Hentine	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
683:							
Hentine	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
Henneke	D	None	---	---	>6.0	---	---
684:							
Hentine	D	None	---	---	>6.0	---	---
Henneke	D	None	---	---	>6.0	---	---
685:							
Stonyford	D	None	---	---	>6.0	---	---
Stonyford	D	None	---	---	>6.0	---	---
687:							
Hentine	D	None	---	---	>6.0	---	---
Henneke	D	None	---	---	>6.0	---	---
Rock outcrop	D	None	---	---	>6.0	---	---
690:							
Sehorn	D	None	---	---	>6.0	---	---
Contra Costa	C	None	---	---	>6.0	---	---
695: Orognen	D	None	---	---	>6.0	---	---
700:							
Hytop	D	None	---	---	>6.0	---	---
Franciscan	C	None	---	---	>6.0	---	---
Vallecitos	D	None	---	---	>6.0	---	---

Table 19.--Soil Features

(The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Soil name and map symbol	Bedrock		Cemented pan		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
	In		In			
100, 101, 102 Capay	>60	---	---	---	High	Moderate.
106 Capay	>60	---	---	---	High	Moderate.
110, 111 El Solyo	>60	---	---	---	High	Low.
116 El Solyo	>60	---	---	---	High	Low.
120:						
Vernalis	>60	---	---	---	High	Low.
Zacharias	>60	---	---	---	High	Low.
121, 122, 123, 125 Vernalis	>60	---	---	---	High	Low.
126:						
Vernalis	>60	---	---	---	High	Low.
Zacharias	>60	---	---	---	High	Low.
127 Vernalis	>60	---	---	---	High	Low.
130, 131 Stomar	>60	---	---	---	High	Low.
140, 141, 142, 144, 145 Zacharias	>60	---		---	High	Low.
146, 147 Zacharias	>60	---	---	---	High	Low.
150 Columbia	>60	---	---	---	Moderate	Low.
151:						
Columbia	>60	---	---	---	Moderate	Low.
Columbia, sandy substratum	>60	---	---	---	Moderate	Low.
153 Columbia	>60	---	---	---	Moderate	Low.
155 Columbia	>60	---	---	---	Moderate	Low.
157:						
Columbia	>60	---	---	---	Moderate	Low.
Columbia, sandy substratum	>60	---	---	---	Moderate	Low.

Table 19.--Soil Features--Continued

Soil name and map symbol	Bedrock		Cemented pan		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
	In		In			
159:						
Columbia	>60	---	---	---	Moderate	Low.
Columbia, sandy substratum	>60	---	---	---	Moderate	Low.
160 Merritt	>60	---	---	---	High	Low.
165 Merritt	>60	---	---	---	High	Low.
170:						
Dospalos	>60	---	---		High	Moderate.
Bolfar	>60	---	---	---	High	Low.
175:						
Dospalos	>60	---	---	---	High	Moderate.
Bolfar	>60	---	---	---	High	Low.
180 Dello	>60	---	---	---	High	Low.
190 Clear Lake	>60	---	---	---	High	Moderate.
195 Clear Lake	>60	---	---	---	High	Moderate.
200 Veritas	>60	---	40-60	Thick	High	Low.
210 Cortina	>60	---	---	---	Moderate	Moderate.
215 Yokut	>60	---	---		High	Low.
220:						
Xerofluvents	>60	---	---	---	Moderate	Low.
Xerorthents	>60	---	---	---	Moderate	Low.
245:						
Bolfar	>60	---	---	---	High	Low.
Columbia, sandy substratum	>60	---	---	---	Moderate	Low.
246:						
Bolfar	>60	---	---	---	High	Low.
Columbia, sandy substratum	>60	---	---	---	Moderate	Low.
252, 253:						
Chaqua	40-60	Soft	---	---	Moderate	Low.
Arburua	20-40	Hard	---	---	High	Low.

Table 19.--Soil Features--Continued

Soil name and map symbol	Bedrock: Depth	Bedrock: Hardness	Cemented pan: Depth	Cemented pan: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In		In			
255:						
Calla	>60	---	---	---	High	Low.
Carbona	>60	---	---	---	High	Low.
270, 271 Elsalado	>60	---	---	---	High	Low.
272, 273, 274 Elsalado	>60	---	---	---	High	Low.
281 Carbona	>60	---	---	---	High	Low.
290, 291:						
Carbona	>60	---	---	---	High	Low.
Orognen	>60	---	---	---	High	Low.
300, 301, 302, 303, 304 Damluis	>60	---	---	---	High	Low.
310 Deldota	>60	---	---	---	High	Low.
320 Dosamigos	>60	---	---	---	High	Low.
330 Pedcat	>60	---	---	---	High	Moderate.
331 Pedcat	>60	---	---	---	High	Moderate.
340:						
Carranza	>60	---	---	---	Moderate	Low.
Woo	>60	---	---	---	High	Low.
350 Woo	>60	---	---	---	High	Low.
400, 401:						
Alo	24-40	Soft	---	---	High	Low.
Vaquero	20-40	Soft	---	---	High	High.
410 Ayar	40-60	Soft	---	---	High	Low.
420:						
Ayar	40-60	Soft	---	---	High	Low.
Oneil	20-40	Hard	---	---	Moderate	Low.
430:						
Vaquero	20-40	Soft	---	---	High	High.
Carbona	>60	---	---	---	High	Low.
500, 501:						
Wisflat	10-20	Hard	---	---	High	Low.

Table 19.--Soil Features--Continued

Soil name and map symbol	Bedrock		Cemented pan		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
	In		In			
500, 501:						
Arburua	20-40	Hard	---		High	Low.
San Timoteo	20-40	Soft	---	---	High	Low.
502:						
Arburua	20-40	Hard	---	---	High	Low.
Wisflat	10-20	Hard	---	---	High	Low.
505, 506:						
Arburua	20-40	Hard	---	---	High	Low.
Contra Costa	20-40	Hard	---	---	Moderate	Moderate.
Wisflat	10-20	Hard	---	---	High	Low.
510:						
Arburua	20-40	Hard	---	---	High	Low.
Wisflat	10-20	Hard	---	---	High	Low.
Rock outcrop	0	Hard	---	---	---	---
520, 521:						
Wisflat	10-20	Hard	---	---	High	Low.
Rock outcrop	0	Hard	---	---	---	---
530 Oneil	20-40	Hard	---	---	Moderate	Low.
540 Oquin	20-40	Soft	---	---	High	Low.
600, 601:						
Gonzaga	20-40	Hard	---	---	High	Low.
Honker	20-40	Hard	---	---	Moderate	Low.
Franciscan	20-40	Hard	---	---	High	Low.
610, 611:						
Honker	20-40	Hard	---	---	Moderate	Low.
Vallecitos	10-20	Hard	---	---	High	Low.
Honker, eroded	20-40	Hard	---	---	Moderate	Low.
612:						
Honker	20-40	Hard	---	---	Moderate	Low.
Vallecitos	10-20	Hard	---	---	High	Low.
Gonzaga	20-40	Hard	---	---	High	Low.
613, 614:						
Honker	20-40	Hard	---	---	Moderate	Low.
Gaviota	10-20	Hard	---	---	Moderate	Moderate.
615:						
Honker	20-40	Hard	---	---	Moderate	Low.

Table 19.--Soil Features--Continued

Soil name and map symbol	Bedrock: Depth	Bedrock: Hardness	Cemented pan: Depth	Cemented pan: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In		In			
615:						
Quinto	10-20	Hard	---	---	Moderate	Low.
620 Franciscan	20-40	Hard	---	---	Moderate	Low.
625:						
Franciscan	20-40	Hard	---	---	Moderate	Low.
Quinto	10-20	Hard	---	---	Moderate	Low.
Honker	20-40	Hard	---	---	Moderate	Low.
630, 631:						
Millsholm	10-20	Hard	---	---	Moderate	Moderate.
Honker	20-40	Hard	---	---	Moderate	Low.
Rock outcrop	0	Hard	---	---	---	---
635 Millsholm	10-20	Hard	---	---	Moderate	Moderate.
640:						
Quinto	10-20	Hard	---	---	Moderate	Low.
Millsholm	10-20	Hard	---	---	Moderate	Moderate.
Rock outcrop	0	Hard	---	---	---	
650:						
Quinto	10-20	Hard	---	---	Moderate	Low.
Rock outcrop	0	Hard	---	---	---	---
660 Gaviota	10-20	Hard	---	---	Moderate	Moderate.
661 Gaviota	10-20	Hard	---	---	Moderate	Moderate.
682:						
Henneke	10-20	Hard	---	---	High	Moderate.
Hentine	10-20	Hard	---	---	Moderate	Moderate.
Rock outcrop	0	Hard	---	---	---	---
683:						
Hentine	10-20	Hard	---	---	Moderate	Moderate.
Rock outcrop	0	Hard	---	---	---	---
Henneke	10-20	Hard	---	---	High	Moderate.
684:						
Hentine	10-20	Hard	---	---	Moderate	Moderate.
Henneke	10-20	Hard	---	---	High	Moderate.
685:						
Stonyford	10-20	Hard	---	---	Moderate	Moderate.

Table 19.--Soil Features--Continued

Soil name and map symbol	Bedrock		Cemented pan		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
	In		In			
685:						
Stonyford	10-20	Hard	---	---	Moderate	Moderate.
687:						
Hentine	10-20	Hard	---	--	Moderate	Moderate.
Henneke	10-20	Hard	---	---	High	Moderate.
Rock outcrop	0	Hard	---	---	---	---
690:						
Sehorn	20-40	Hard	---	---	High	Low.
Contra Costa	20-40	Hard	---	---	Moderate	Moderate.
695 Orognen	>60	---		---	High	Low.
700:						
Hytop	20-40	Soft	---	---	High	Low.
Franciscan	20-40	Hard	---	---	Moderate	Low.
Vallecitos	10-20	Hard	---	---	High	Low.

Table 20. Selected Physical Laboratory Data

Soil name and sample number	Horizon	Depth	Particle size distribution: Sand: Very coarse (2.0-1.0 mm)	Coarse (1.0-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Silt (0.25-0.002 mm)	Clay (>0.002 mm)	Water retained: 1/3 bar	15 bar	Bulk density: 1/3 bar	Oven-dry	COLE
		In	Pct							Pct (wt)		g/cc	g/cc	cm/cm
Capay	Ap	0-11	0.1	0.3	2.4	6.5	5.9	35.3	49.5	31.0	18.8	1.34	2.03	0.148
S92CA-099-005	A	11-20	0.2	0.3	2.1	6.2	5.9	35.2	50.1	30.1	19.2	1.55	2.58	0.185
	Bss1	20-30	0.2	0.4	2.0	6.2	6.6	33.9	50.7	25.5	20.5	1.55	1.95	0.080
	Bss2	30-39	0.1	0.4	2.0	7.2	6.4	33.0	50.9	27.7	19.6	1.41	2.01	0.125
	Bk1	39-51	0.2	0.3	2.3	8.1	7.1	34.7	47.3	25.5	17.6	1.49	1.96	0.096
	Bk2	51-60		0.2	2.1	8.7	7.9	35.8	45.3	26.5	16.8	1.46	1.85	0.081
Elsalado	Ap	0-6	2.2	1.9	6.1	20.3	19.6	33.4	16.5	22.1	7.3	1.48	1.57	0.019
S92CA-099-009	Bw1	6-18	0.5	1.0	4.4	21.2	23.2	35.2	14.5	18.2	6.8	1.50	1.67	0.035
	Bw2	18-26	0.3	0.7	4.2	22.6	28.7	32.2	11.3	16.7	5.9	1.40	1.45	0.012
	Bk1	26-33	0.3	0.4	2.8	23.6	25.8	35.4	11.7	19.2	5.7	1.64	1.81	0.033
	Bk2	33-41	0.2	0.3	3.1	20.9	25.0	38.3	12.2	16.0	5.9	1.40	1.50	0.023
	Bk3	41-48	0.3	0.6	4.1	21.9	24.5	36.0	12.6	14.9	5.7	1.39	1.54	0.034
	Bk4	48-60	0.4	0.9	5.0	24.9	28.9	29.4	10.5	16.8	5.8	1.43	1.48	0.011
El Solyo	Ap	0-10	0.1	0.3	1.6	5.0	7.6	52.5	32.9		12.4			
S92CA-099-006	AB	10-17	0.3	0.3	1.2	5.2	6.2	52.5	34.3	20.9	13.3	1.64	1.90	0.050
	Bt	17-30	0.2	0.3	1.2	6.9	5.6	47.4	38.4	20.5	13.3	1.60	1.80	0.040
	Btk1	30-45		0.1	0.7	4.0	6.8	51.6	36.8	21.8	12.6	1.59	1.82	0.046
	Btk2	45-60	0.4	0.4	0.7	2.4	5.6	49.0	41.5	20.2	13.7	1.58	1.78	0.041
Henneke	A	0-5	4.4	8.1	8.9	11.2	10.2	33.0	24.2	24.0	15.6	1.17	1.24	0.016
S92CA-099-004	BAt	5-9	5.0	7.4	8.1	9.1	9.5	26.1	34.8	26.5	17.9	1.29	1.48	0.039
	Bt	9-19	7.6	5.5	4.6	5.6	5.0	16.1	55.6		28.6			
	R	19									6.7			
Hentine	A	0-4	4.3	8.8	10.7	12.4	11.7	28.4	23.7	37.1	20.2	1.05	1.15	0.028
S92CA-099-003	Bt1	4-11	4.6	9.2	10.5	11.5	8.8	24.9	30.4	44.4	21.4	0.92	0.98	0.012
	Bt2	11-18	11.8	15.7	13.3	11.2	5.7	12.7	29.6	35.0	23.2	1.07	1.19	0.013
	R	17									23.6			
Vernalis	Ap	0-10	0.2	0.6	4.3	13.3	12.7	38.9	30.0	18.0	11.5	1.63	2.11	0.090
S92CA-099-002	A	10-20		0.3	4.1	12.6	13.8	39.3	29.9	17.0	13.2	1.47	1.70	0.050
	Bt	20-34	0.1	0.4	3.7	11.9	14.3	44.7	24.9	20.0	11.6	1.47	1.52	0.011
	Btk1	34-46	0.2	0.6	4.7	11.3	14.1	45.0	24.1	19.7	11.0	1.40	1.48	0.019
	Btk2	46-62	0.1	0.6	3.9	10.3	13.8	46.8	24.5	20.2	11.0	1.40	1.57	0.039
Zacharias	Ap	0-7	0.5	1.5	9.6	17.4	15.3	27.0	28.7		11.2			
S92CA-099-001	A	7-14	0.8	1.8	9.3	18.3	13.9	26.8	29.1	15.5	11.8	1.78	1.97	0.034
	Bt1	14-29	0.7	1.9	11.8	21.4	15.9	25.0	23.3	15.0	9.6	1.68	1.78	0.019
	Bt2	29-39	1.1	2.3	15.2	23.2	15.9	20.7	21.6	16.3	9.3	1.61	1.85	0.046
	Bt3	39-50	0.5	1.0	7.5	17.7	24.9	29.7	18.7	14.0	8.5	1.52	1.62	0.021
	Bt4	50-66	0.1	0.3	3.2	11.3	13.3	43.8	28.0	17.1	10.1	1.64	1.81	0.033

Table 21.--Selected Chemical Laboratory Data

Soil name and sample number	Horizon	Depth	Organic carbon	pH: Sat. paste	pH: CaCl2 0.01M (1:2)	pH: H2O (1:1)	Water extracted from saturated paste: Ca	Water extracted: Mg	Water extracted: Na	Water extracted: K	Water extracted: Electrical conductivity	NH4OC extractable cations: Ca	NH4OC extractable cations: Mg	NH4OC extractable cations: Na	NH4OC extractable cations: K	NH4OC extractable cations: Sum of bases	Acidity	CEC: NH4-OAC
		In	Pct				Meq/l				dS/m	Meq/100 g						
Capay	Ap	0-11	0.88	6.6	6.6	6.9	5.0	3.2	4.6	0.3	1.35	21.8	12.1	14.6	1.2	49.7	2.5	35.7
S92CA-099-005	A	11-20	0.81	6.7	6.7	7.2	2.1	1.3	3.2	0.1	0.74	21.8	11.4	1.3	0.9	35.4	2.2	36.1
	Bss1	20-30	0.73	6.6	6.6	7.0	2.1	1.2	3.6	0.2	0.76	21.3	11.8	1.5	1.0	35.6	2.9	35.6
	Bss2	30-39	0.58	6.9	6.8	7.3	2.2	1.2	3.3	0.2	0.74	22.0	11.4	1.4	0.8	35.6	1.7	36.0
	Bk1	39-51	0.43	7.8	7.8	8.2	2.7	1.3	3.4	0.1	0.80	35.2	10.9	1.3	0.6	48.0		35.3
	Bk2	51-60	0.29	7.7	7.9	8.3	2.7	1.2	3.2	0.1	0.76	39.3	9.5	1.3	0.5	50.6		33.1
Elsalado	Ap	0-6	0.75	7.4	7.5	7.7	17.2	14.3	13.7	0.8	4.13	11.3	6.0	1.1	0.4	18.8	0.1	14.0
S92CA-099-009	Bw1	6-18	0.41	7.9	7.9	8.4	3.6	2.4	5.7	0.2	1.16	29.2	5.1	0.9	0.3	35.5		13.2
	Bw2	18-26	0.26	8.1	7.9	8.5	2.9	1.8	5.3	0.2	1.04	35.8	5.0	1.0		41.9		11.7
	Bk1	26-33	0.24	8.1	8.0	8.6	2.9	2.0	6.5	0.2	1.18	33.7	5.6	1.1	0.2	40.6		11.9
	Bk2	33-41	0.22	8.1	8.0	8.6	3.4	2.6	8.6	0.4	1.51	34.5	5.9	1.2	0.1	41.7		11.7
	Bk3	41-48	0.23	8.1	8.1	8.6	3.3	2.7	9.7	0.3	1.61	31.5	6.9	1.5	0.2	40.1		11.6
	Bk4	48-60	0.22	8.1	8.1	8.5	4.4	3.6	11.1	0.2	1.88	35.1	5.5	1.1	0.2	41.9		11.9
El Solyo	Ap	0-10	1.33	7.8	7.6	7.9	9.3	5.2	11.2	0.4	2.41	16.9	6.4	2.1	0.8	26.2		21.1
S92CA-099-006	AB	10-17	0.94	7.9	7.8	8.8	3.4	1.9	7.0	0.2	1.22	16.2	6.4	1.8	0.5	24.9	0.4	21.3
	Bt	17-30	0.40	7.9	7.9	8.3	5.8	3.2	16.4	0.1	2.32	20.8	7.9	3.6	0.4	32.7	0.6	25.2
	Btk1	30-45	0.28	7.8	7.9	8.2	9.9	5.0	20.6	0.1	3.12	31.1	6.6	4.0	0.3	42.0		21.8
	Btk2	45-60	0.20	7.8	7.9	8.1	10.4	5.1	19.9		3.17	25.3	6.5	4.0	0.3	36.1	0.1	22.0
Henneke	A	0-5	3.61		6.3	7.0						11.0	16.6	0.1	0.6	28.3	6.2	29.2
S92CA-099-004	BAt	5-9	1.28		6.5	7.2						5.5	21.4		0.5	27.4	4.7	28.1
	Bt	9-19	0.97		6.5	7.3						4.9	42.7	0.1	0.5	48.2	5.2	49.1
	R	19			8.5	9.0												
Hentine	A	0-4	2.84		6.5	7.1						8.6	16.8	0.1	0.7	26.2	6.3	25.7
S92CA-099-003	Bt1	4-11	1.47		6.7	7.5						6.9	19.0	0.1	0.4	26.4	4.8	27.5
	Bt2	11-18	0.73		6.8	7.5						3.9	22.7	0.1	0.3	27.0	3.0	26.4
	R	18			6.8	7.5												
Vernalis	Ap	0-10	0.64	7.3	7.0	7.4	5.6	3.8	4.3	0.4	1.31	15.3	7.8	0.8	0.7	24.6	1.6	23.8
S92CA-099-002	A	10-20	0.55	7.0	6.8	7.4	3.0	1.9	4.2	0.2	0.92	15.5	7.7	1.1	0.4	24.7	3.0	24.2
	Bt	20-34	0.31	7.5	7.5	7.8	8.2	4.6	6.2	0.1	1.71	19.1	7.4	1.1	0.3	27.9	1.2	23.9
	Btk1	34-46	0.20	7.8	7.8	8.1	10.8	3.6	5.3	0.1	1.83	38.5	5.3	0.9	0.2	44.9		22.3
	Btk2	46-62	0.21	7.8	7.8	8.2	8.3	2.6	4.6	0.1	1.51	43.6	4.9	0.8	0.4	49.7		22.1
Zacharias	Ap	0-7	0.96	6.9	6.6	6.9	8.0	5.9	8.3	0.2	2.04	13.8	7.2	1.3	0.4	22.7	2.3	22.1
S92CA-099-001	A	7-14	0.45	6.7	6.5	7.1	2.3	1.5	3.9	0.1	0.80	13.6	7.2	1.0	0.3	22.1	1.7	22.1
	Bt1	14-29	0.18		6.7	7.5						11.5	6.3	0.9	0.1	18.8	1.8	19.2
	Bt2	29-39	0.11		6.9	7.7						11.2	6.4	0.9	0.2	18.7	0.9	18.4
	Bt3	39-50	0.10		7.0	7.9						11.7	6.5	1.1	0.2	19.5	2.0	19.1
	Bt4	50-66	0.06	7.4	7.3	8.0	2.5	1.7	7.9	0.1	1.25	13.8	9.7	2.3	0.2	26.0	2.0	23.5

Table 22.--Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Alo	Fine, smectitic, thermic Aridic Haploxererts
Arburua	Fine-loamy, mixed, superactive, calcareous, thermic Typic Xerorthents
Ayar	Fine, smectitic, thermic Typic Haploxererts
Bolfar	Fine-loamy, mixed, superactive, calcareous, thermic Cumulic Endoaquolls
Calla	Fine-loamy, mixed, superactive, thermic Typic Calcixerepts
Capay	Fine, smectitic, thermic Typic Haploxererts
Carbona	Fine, smectitic, thermic Vertic Haploxerolls
Carranza	Fine-loamy, mixed, superactive Pachic Haploxerolls
Chaqua	Fine-loamy, mixed, superactive, thermic Typic Calcixerepts
Clear Lake	Fine, smectitic, thermic Xeric Endoaquerts
Columbia	Coarse-loamy, mixed, superactive, nonacid, thermic Oxyaquic Xerofluvents
Contra Costa	Fine, mixed, superactive, thermic Mollic Hapoxeralfs
Cortina	Loamy-skeletal, mixed, superactive, nonacid, thermic Typic Xerofluvents
Damluis	Fine, smectitic, thermic Calcic Pachic Argixerolls
Deldota	Fine, smectitic, thermic Vertic Haploxerolls
Dello	Mixed, thermic Typic Psammaquents
Dosamigos	Fine, smectitic, thermic Aquic Haploxerolls
Dospalos	Fine, smectitic, calcareous, thermic Vertic Endoaquolls
El Solyo	Fine, mixed, superactive, thermic Calcic Haploxerepts
Elsalado	Coarse-loamy, mixed, superactive, calcareous, thermic Fluventic Haploxerepts
Franciscan	Fine-loamy, mixed, superactive, thermic Typic Argixerolls
Gaviota	Loamy, mixed, superactive, nonacid, thermic Lithic Xerorthents
Gonzaga	Fine, mixed, superactive, thermic Typic Palexerolls
Henneke	Clayey-skeletal, magnesic, thermic Lithic Argixerolls
Hentine	Loamy-skeletal, magnesic, thermic Lithic Argixerolls
Honker	Fine, mixed, superactive, thermic Mollic Palexeralfs
Hytop	Fine, mixed, superactive, thermic Typic Palexeralfs
Merritt	Fine-silty, mixed, superactive, thermic Fluvaquentic Haploxerolls
Millsholm	Loamy, mixed, superactive, thermic Lithic Haploxerepts
Oneil	Fine-silty, mixed, superactive, thermic Calcic Haploxerolls
Oquin	Coarse-loamy, mixed, superactive, thermic Calcic Haploxerolls
Orognen	Fine, mixed, superactive, thermic Typic Palexeralfs
*Orognen	Fine, mixed, superactive, thermic Mollic Palexeralfs
Pedcat	Fine, mixed, superactive, thermic Aquic Natrixeralfs
Quinto	Loamy, mixed, superactive, thermic Lithic Mollic Haploxeralfs
San Timoteo	Coarse-loamy, mixed, superactive, calcareous, thermic Typic Xerorthents
Sehorn	Fine, smectitic, thermic Aridic Haploxererts
Stomar	Fine, smectitic, thermic Mollic Haploxeralfs
Stonyford	Loamy, mixed, superactive, thermic Lithic Haploxeralfs
Vallecitos	Clayey, smectitic, thermic Lithic Ruptic-Xerochreptic Haploxeralfs
Vaquero	Fine, smectitic, thermic Aridic Haploxererts
Veritas	Coarse-loamy, mixed, superactive, thermic Typic Haploxerolls
Vernalis	Fine loamy, mixed, superactive, thermic Calcic Haploxerepts
Wisflat	Loamy, mixed, superactive, calcareous, thermic Lithic Xerorthents
Woo	Fine-loamy, mixed, thermic Calic Haploxerolls
Xerofluvents	Xerofluvents
Xerorthents	Xerorthents
Yokut	Loamy-skeletal, mixed, superactive, thermic Typic Haploxeralfs
Zacharias	Fine-loamy, mixed, superactive, thermic Typic Haploxerepts

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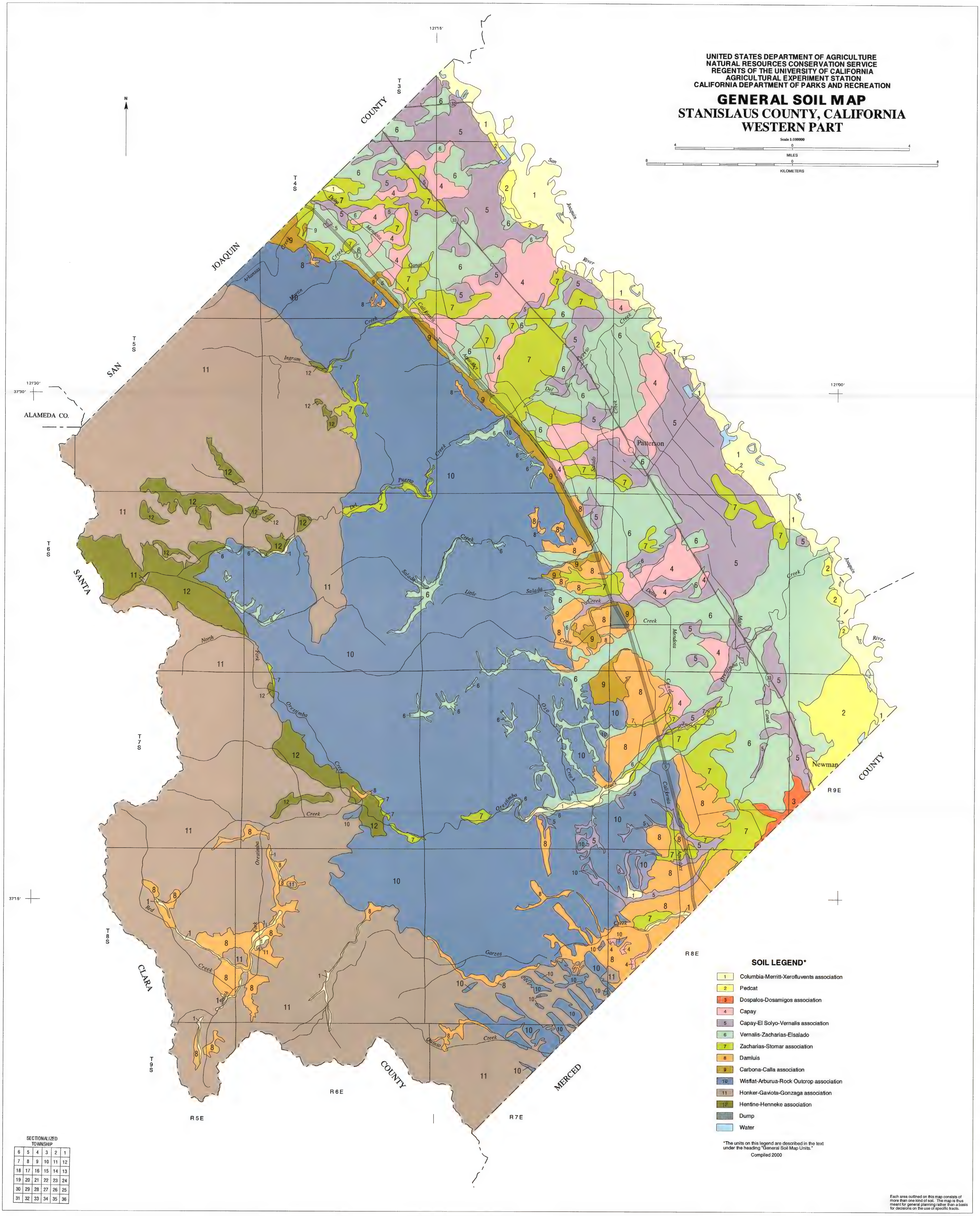
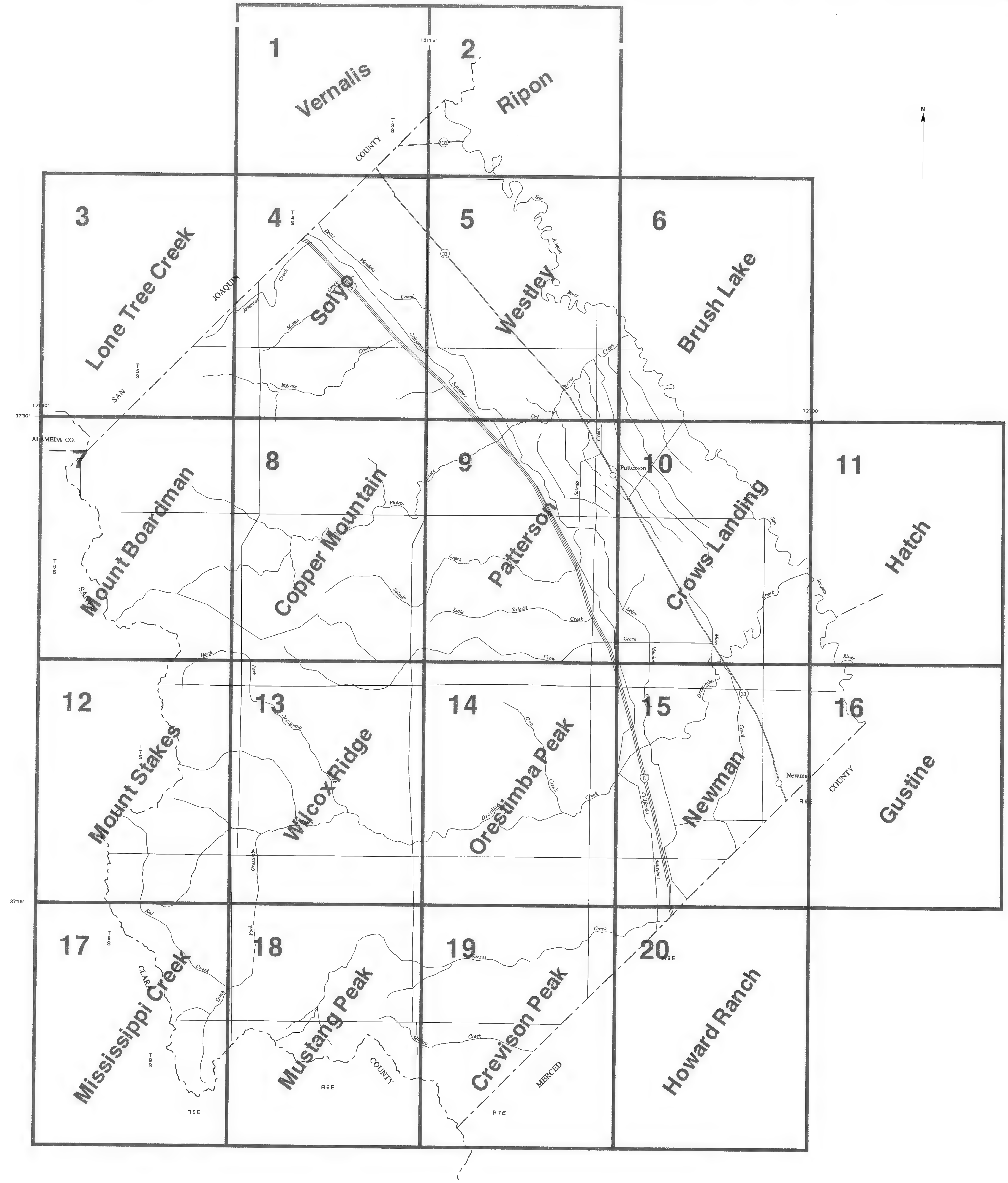

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
REGENTS OF THE UNIVERSITY OF CALIFORNIA
AGRICULTURAL EXPERIMENT STATION
CALIFORNIA DEPARTMENT OF PARKS AND RECREATION
GENERAL SOIL MAP
STANISLAUS COUNTY, CALIFORNIA
WESTERN PART
Scale 1:100000
MILES
KILOMETERS
SAN JOAQUIN COUNTY
SANTA CLARA COUNTY
MERCED COUNTY
ALAMEDA CO.
Patterson
Newman
San Joaquin River
Del Puerto Creek
Orestimba Creek
Salado Creek
Little Salado Creek
Crow Creek
Garzas Creek
Quinto Creek
Ingram Creek
Hospital Creek
Delta Mendota Canal
California Aqueduct
T 3 S
T 4 S
T 5 S
T 6 S
T 7 S
T 8 S
T 9 S
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
SOIL LEGEND*
1 Columbia-Merritt-Xerofluvents association
2 Pedcat
3 Dospalos-Dosamigos association
4 Capay
5 Capay-El Solyo-Vernalis association
6 Vernalis-Zacharias-Elsalado
7 Zacharias-Stomar association
8 Damluis
9 Carbona-Calla association
10 Wisflat-Arburua-Rock Outcrop association
11 Honker-Gaviota-Gonzaga association
12 Hentine-Henneke association
Dump
Water
*The units on this legend are described in the text under the heading "General Soil Map Units."
Compiled 2000
SECTIONALIZED TOWNSHIP
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
STANISLAUS COUNTY, CALIFORNIA
WESTERN PART

Scale 1:126720

MILES

KILOMETERS

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART

REGENTS OF THE UNIVERSITY OF CALIFORNIA
AGRICULTURAL EXPERIMENT STATION
CALIFORNIA DEPARTMENT OF PARKS AND RECREATION

SOIL LEGEND

The publication symbols consist of three numbers starting with 100, and the map units will be arranged by map unit name and numerically throughout this report. There may be gaps in the sequence since the publication symbols are also the field symbols approved by this document

SYMBOL	NAME
100	Capay clay, 0 to 2 percent slopes
101	Capay clay, wet, 0 to 2 percent slopes
102	Capay clay, loamy substratum, 0 to 2 percent slopes
106	Capay clay, 0 to 2 percent slopes, rarely flooded
110	El Solyo silty clay loam, 0 to 2 percent slopes
111	El Solyo clay loam, wet, 0 to 2 percent slopes
116	El Solyo silty clay loam, 0 to 2 percent slopes, rarely flooded
120	Vernalis-Zacharias complex, 0 to 2 percent slopes
121	Vernalis loam, wet, 0 to 2 percent slopes
122	Vernalis loam, 0 to 2 percent slopes
123	Vernalis clay loam, wet, 0 to 2 percent slopes
125	Vernalis clay loam, 0 to 2 percent slopes
126	Vernalis-Zacharias complex, 0 to 2 percent slopes, rarely flooded
127	Vernalis loam, 0 to 2 percent slopes, rarely flooded
128	Water
130	Stomar clay loam, 0 to 2 percent slopes
131	Stomar clay loam, wet, 0 to 2 percent slopes
140	Zacharias clay loam, 0 to 2 percent slopes
141	Zacharias clay loam, wet, 0 to 2 percent slopes
142	Zacharias gravelly clay loam, 0 to 2 percent slopes
144	Zacharias gravelly clay loam, 2 to 5 percent slopes
145	Zacharias clay loam, 2 to 5 percent slopes
146	Zacharias clay loam, 0 to 2 percent slopes, rarely flooded
147	Zacharias gravelly clay loam, 0 to 2 percent slopes, rarely flooded
150	Columbia fine sandy loam, 0 to 2 percent slopes, occasionally flooded
151	Columbia complex, 0 to 2 percent slopes, occasionally flooded
153	Columbia fine sandy loam, channeled, 0 to 2 percent slopes, frequently flooded
155	Columbia fine sandy loam, 0 to 2 percent slopes, rarely flooded
157	Columbia complex, 0 to 2 percent slopes, rarely flooded
159	Columbia complex, 0 to 2 percent slopes, frequently flooded
160	Merritt silty clay loam, 0 to 2 percent slopes, occasionally flooded
165	Merritt silty clay loam, 0 to 2 percent slopes, rarely flooded
170	Dospalos-Bolfar complex, 0 to 2 percent slopes, occasionally flooded
175	Dospalos-Bolfar complex, 0 to 2 percent slopes, rarely flooded
176	Dumps
180	Dello fine sandy loam, channeled, 0 to 2 percent slopes, frequently flooded
190	Clear Lake clay, 0 to 2 percent slopes, occasionally flooded
195	Clear Lake clay, 0 to 2 percent slopes, rarely flooded
200	Veritas sandy loam, 0 to 2 percent slopes, rarely flooded
210	Cortina gravelly sandy loam, 0 to 2 percent slopes, rarely flooded
215	Yokut sandy loam, 0 to 2 percent slopes
220	Xerofluvents-Xerorthents complex, 0 to 5 percent slopes, occasionally flooded
245	Bolfar-Columbia complex, 0 to 2 percent slopes, rarely flooded
246	Bolfar-Columbia complex, 0 to 2 percent slopes, occasionally flooded
252	Chaqua-Arburua complex, 5 to 8 percent slopes
253	Chaqua-Arburua complex, 8 to 15 percent slopes
255	Calla-Carbona complex, 30 to 50 percent slopes
270	Elsalado fine sandy loam, 0 to 2 percent slopes, rarely flooded
271	Elsalado loam, 0 to 2 percent slopes, rarely flooded
272	Elsalado loam, wet, 0 to 2 percent slopes
273	Elsalado fine sandy loam, 0 to 2 percent slopes
274	Elsalado loam, 0 to 2 percent slopes
281	Carbona clay loam, 2 to 8 percent slope

SYMBOL	NAME
290	Carbona-Orognen complex, 15 to 30 percent slopes
291	Carbona-Orognen complex, 30 to 50 percent slopes
300	Damluis clay loam, 0 to 2 percent slopes
301	Damluis clay loam, 2 to 8 percent slopes
302	Damluis gravelly clay loam, 0 to 2 percent slopes
303	Damluis gravelly clay loam, 2 to 8 percent slopes
304	Damluis gravelly clay loam, 8 to 15 percent slopes
310	Deldota clay, 0 to 2 percent slopes
320	Dosamigos clay loam, 0 to 2 percent slopes
330	Pedcat clay loam, 0 to 2 percent slopes, rarely flooded
331	Pedcat clay loam, 0 to 2 percent slopes
340	Carranza-Woo complex, 0 to 2 percent slopes
350	Woo loam, 0 to 2 percent slopes
400	Alo-Vaquero complex, 15 to 30 percent slopes
401	Alo-Vaquero complex, 30 to 50 percent slopes
410	Ayar clay, 30 to 50 percent slopes
420	Ayar-Oneil complex, 30 to 50 percent slopes
430	Vaquero Carbona complex, 8 to 30 percent slopes
500	Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes
501	Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes
502	Arburua-Wisflat complex, 8 to 15 percent slopes
505	Arburua-Contra Costa-Wisflat complex, 30 to 50 percent slopes
506	Arburua-Contra Costa-Wisflat complex, 50 to 75 percent slopes
510	Arburua-Wisflat-Rock outcrop, 30 to 65 percent slopes
520	Wisflat-Rock outcrop complex, 30 to 50 percent slopes
521	Wisflat-Rock outcrop complex, 50 to 75 percent slopes
530	Oneil silt loam, 15 to 30 percent slopes
540	Oquin fine sandy loam, 15 to 30 percent slopes
600	Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes
601	Gonzaga-Honker-Franciscan complex, 50 to 75 percent slopes
610	Honker-Vallecitos-Honker, eroded, complex, 30 to 50 percent slopes
611	Honker-Vallecitos-Honker, eroded, complex, 50 to 75 percent slopes
612	Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes
613	Honker-Gaviota complex, 30 to 50 percent slopes
614	Honker-Gaviota complex, 50 to 70 percent slopes
615	Honker-Quinto complex, 30 to 50 percent slopes
620	Franciscan sandy loam, 50 to 70 percent slopes
625	Franciscan-Quinto-Honker complex, 50 to 75 percent slopes
630	Millsholm-Honker-Rock outcrop complex, 30 to 50 percent slopes
631	Millsholm-Honker-Rock outcrop complex, 50 to 75 percent slopes
635	Millsholm loam, 50 to 65 percent slopes
640	Quinto-Millsholm-Rock outcrop complex, 40 to 75 percent slopes
650	Quinto Rock outcrop complex, 50 to 75 percent slopes
660	Gaviota loam, 30 to 50 percent slopes
661	Gaviota gravelly loam, 30 to 75 percent slopes, eroded
682	Henneke-Hentine-Rock outcrop complex, 30 to 70 percent slopes
683	Hentine-Rock outcrop-Henneke complex, 30 to 70 percent slopes
684	Hentine Henneke complex, 30 to 70 percent slopes
685	Stonyford complex, 15 to 50 percent slopes
687	Hentine-Henneke-Rock outcrop complex, 30 to 70 percent slopes
690	Sehorn-Contra Costa complex, 30 to 50 percent slopes
695	Orognen sandy loam, 8 to 30 percent slopes
700	Hytop-Franciscan-Vallecitos complex, 50 to 75 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small (Named where applicable)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line (label only)
- Intermittent (label only)
- Drainage end (label only)
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

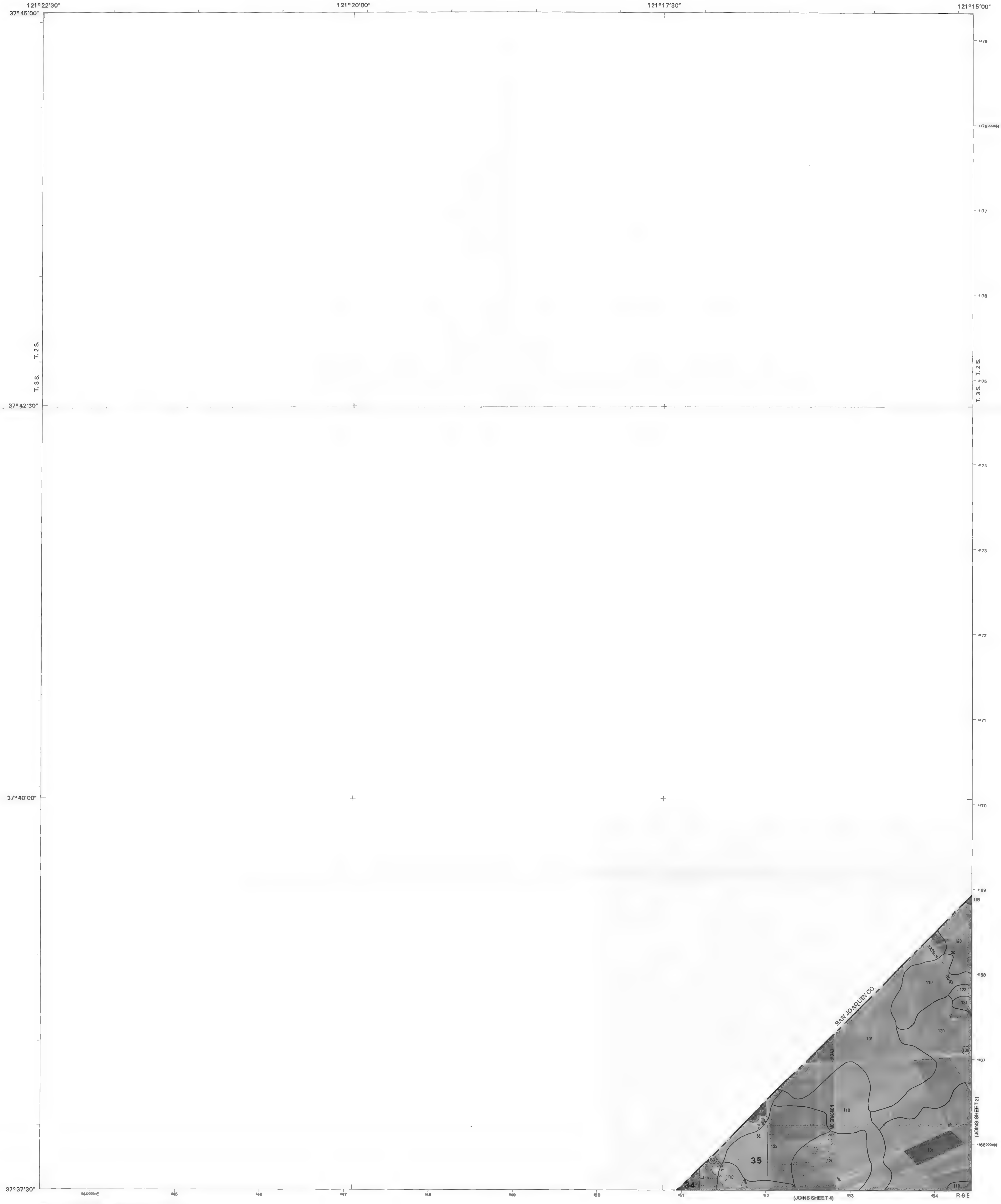
SOIL SAMPLE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Short, flat slope
- Dunpan
- Beaches
- Saline sodic spot
- Serpentine outcrop
- Cobbly spot
- Sandy loam surface
- Detrimental deposits

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
VERNALIS QUADRANGLE
SHEET NUMBER 1



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North American Datum of 1927 (NAD27). Clarke 1866 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 10. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

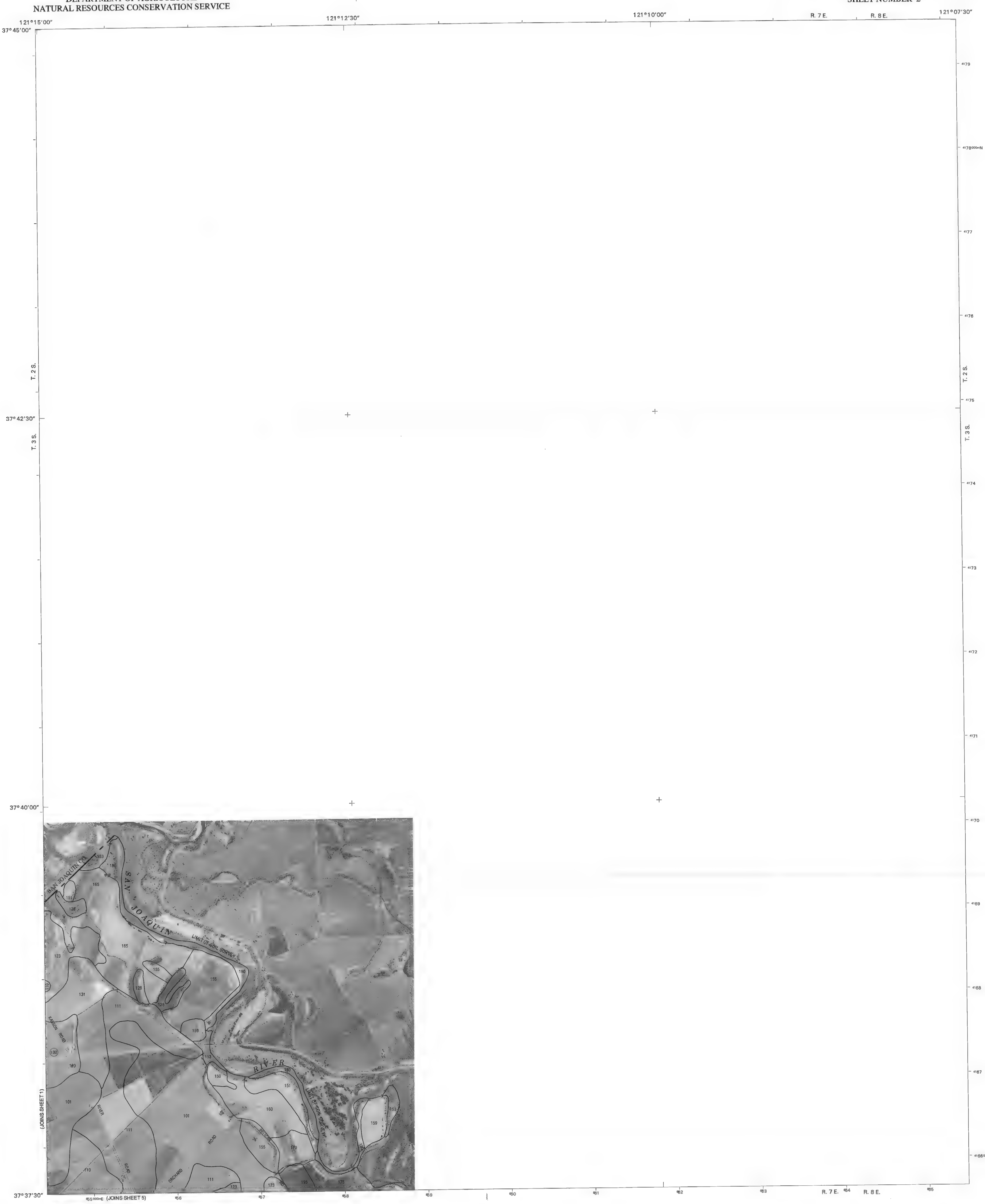
1 UNION ISLAND
2 LATHROP
3 MANTECA
4 TRACY
5 RIPON
6 LONE TREE CREEK
7 SOLYO
8 WESTLEY

INDEX TO ADJOINING 7.5 MAPS

VERNALIS, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 1

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
RIPON QUADRANGLE
SHEET NUMBER 2



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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1	2	3
4		5
6	7	8

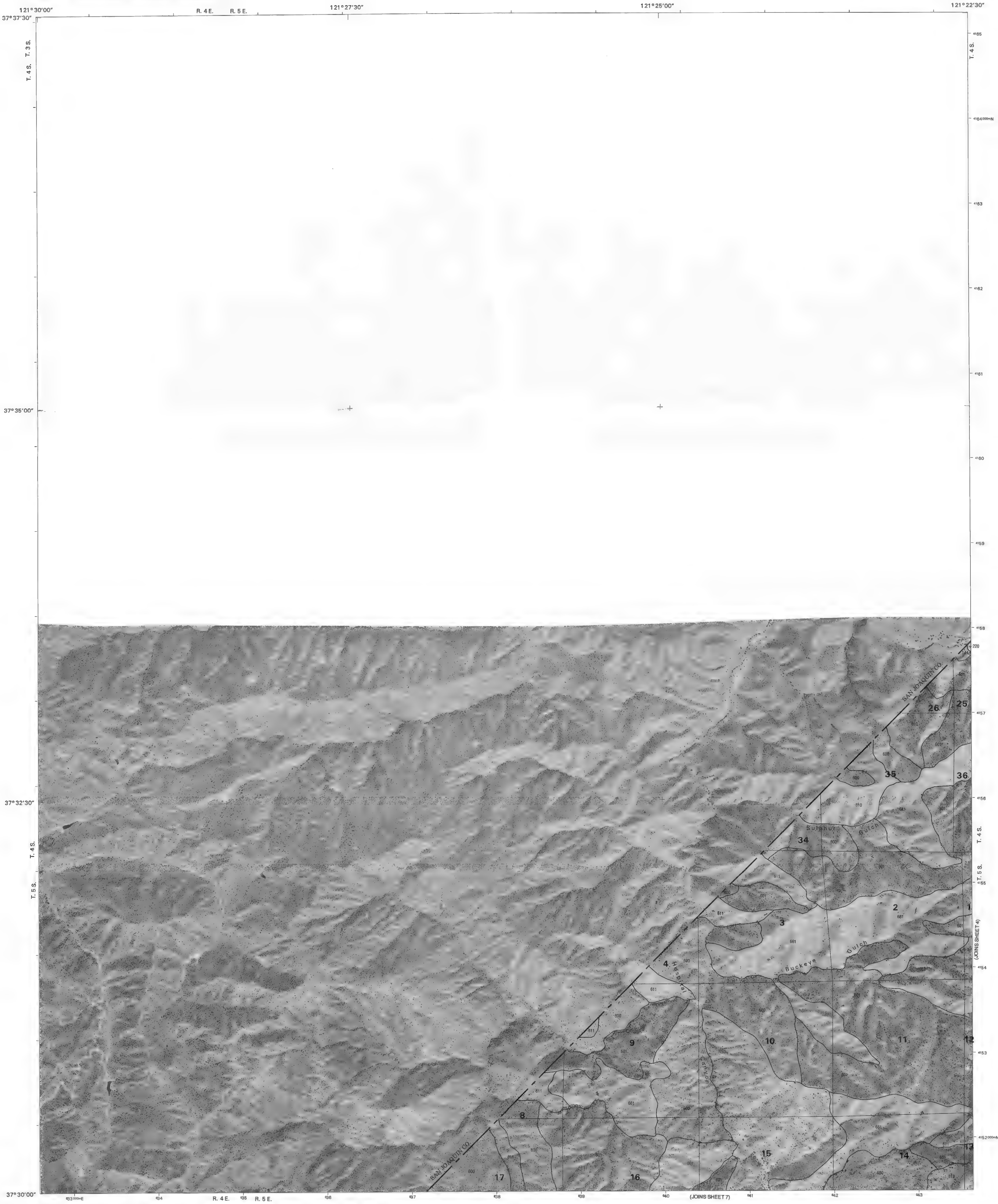
1 LATHROP
2 MANTECA
3 AVENA
4 VERNALIS
5 SALIDA
6 SOLYO
7 WESTLEY
8 BRUSH LAKE

INDEX TO ADJOINING 7.5 MAPS

RIPON, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 2

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
LONE TREE CREEK QUADRANGLE
SHEET NUMBER 3



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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1 MIDWAY
2 TRACY
3 VERNALIS
4 CEDAR MOUNTAIN
5 SOLYO
6 EYLAR MOUNTAIN
7 MOUNT BOARDMAN
8 COPPER MOUNTAIN

INDEX TO ADJOINING 7.5 MAPS

LONE TREE CREEK, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 3

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
SOLYO QUADRANGLE
SHEET NUMBER 4

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1970 aerial photography. Hydrography and culture information were acquired from U.S. Geological Survey data; therefore, some features may not align exactly with base imagery.

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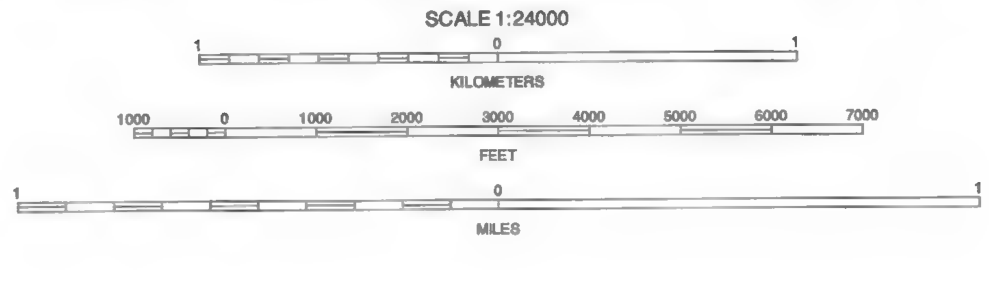
SCALE 1:24000



1	2	3
4		5
6	7	8

1 TRACY
2 VERNALIS
3 RIPON
4 LONE TREE CREEK
5 WESTLEY
6 MOUNT BOARDMAN
7 COPPER MOUNTAIN
8 PATTERSON

INDEX TO ADJOINING 7.5 MAPS

SOLYO, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 4

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
WESTLEY QUADRANGLE
SHEET NUMBER 5

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1	2	3
4		5
6	7	8

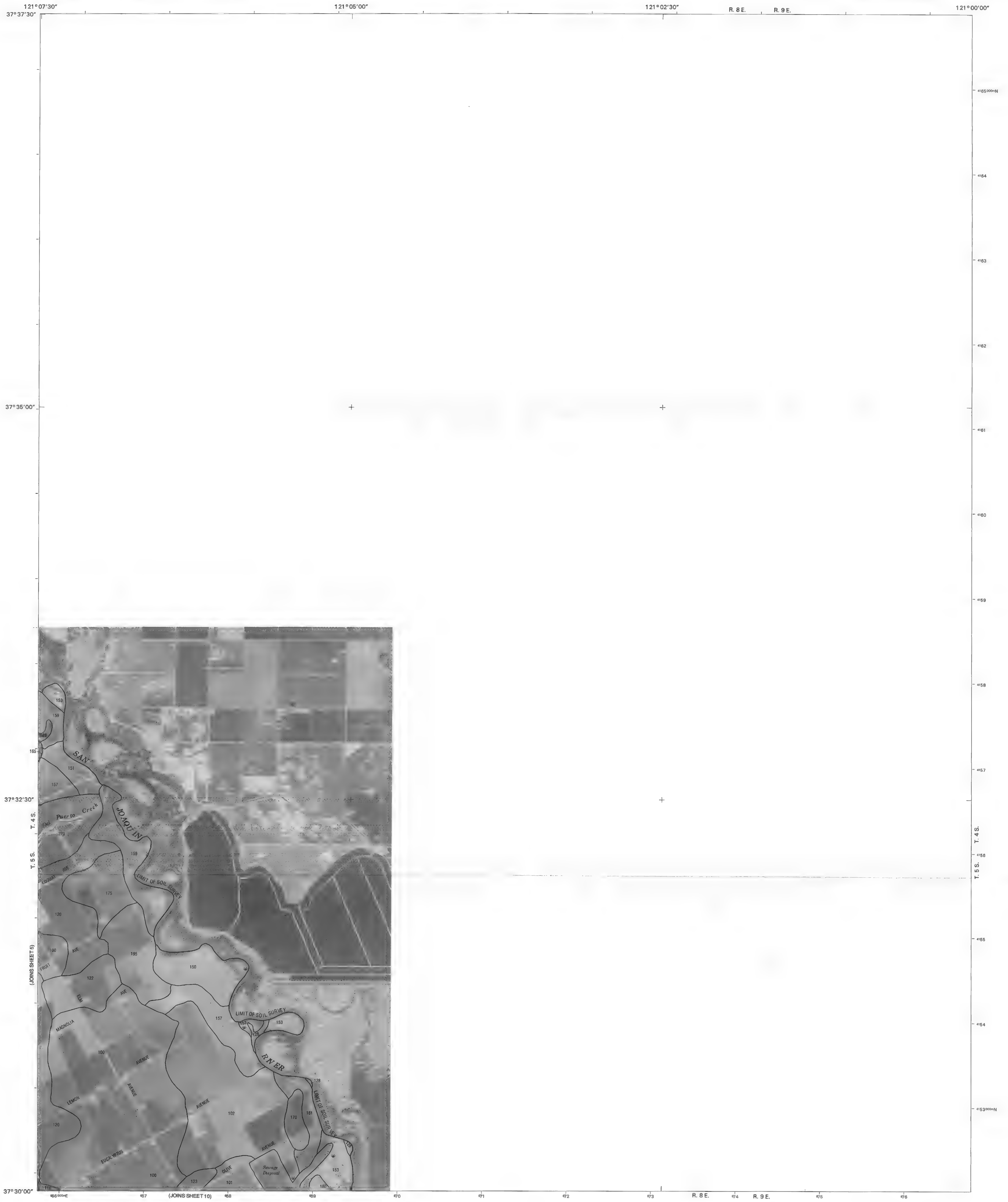
1 VERNALIS
2 RIPON
3 SALIDA
4 SOLYO
5 BRUSH LAKE
6 COPPER MOUNTAIN
7 PATTERSON
8 CROWS LANDING

INDEX TO ADJOINING 7.5 MAPS

WESTLEY, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 5

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
BRUSH LAKE QUADRANGLE
SHEET NUMBER 6



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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1 RIPON
2 SALIDA
3 RIVERBANK
4 WESTLEY
5 CERES
6 PATTERSON
7 CROWS LANDING
8 HATCH

INDEX TO ADJOINING 7.5 MAPS

BRUSH LAKE, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 6

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
MOUNT BOARDMAN QUADRANGLE
SHEET NUMBER 7

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1	2	3
4		5
6	7	8

1 CEDAR MOUNTAIN
2 LONE TREE CREEK
3 SOLYO
4 EYLAR MOUNTAIN
5 COPPER MOUNTAIN
6 ISABEL VALLEY
7 MOUNT STAKES
8 WILCOX RIDGE

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MOUNT BOARDMAN, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 7

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
COPPER MOUNTAIN QUADRANGLE
SHEET NUMBER 8

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1970 aerial photography. Hydrography and culture information were acquired from U.S. Geological Survey data; therefore, some features may not align exactly with base imagery.

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1	2	3
4		5
6	7	8

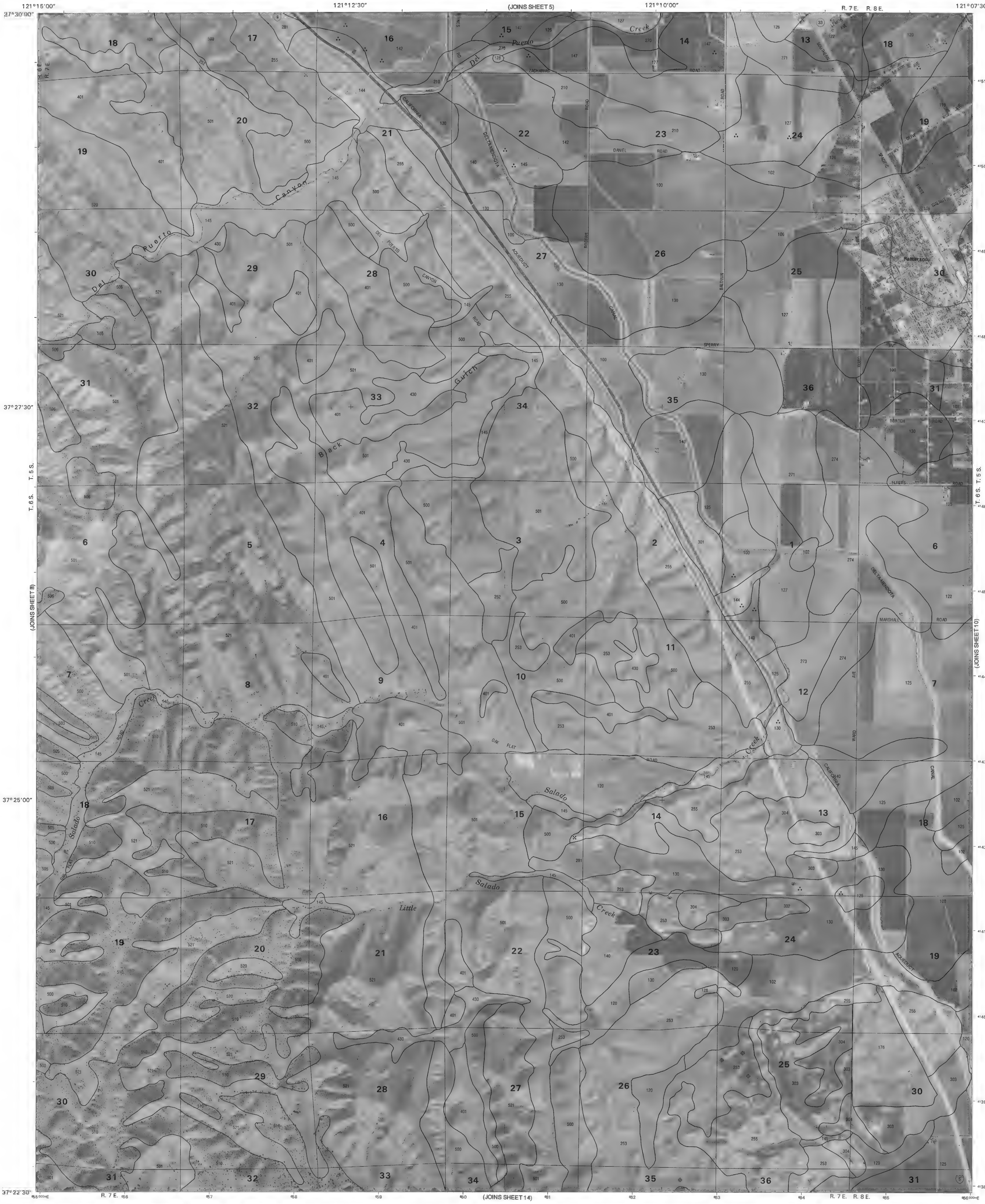
1 LONE TREE CREEK
2 SOLYO
3 WESTLEY
4 MOUNT BOARDMAN
5 PATTERSON
6 MOUNT STAKES
7 WILCOX RIDGE
8 ORESTIMBA PEAK

INDEX TO ADJOINING 7.5 MAPS

COPPER MOUNTAIN, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 8

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
PATTERSON QUADRANGLE
SHEET NUMBER 9



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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1 SOLYO
2 WESTLEY
3 BRUSH LAKE
4 COPPER MOUNTAIN
5 CROWS LANDING
6 WILCOX RIDGE
7 ORESTIMBA PEAK
8 NEWMAN

INDEX TO ADJOINING 7.5 MAPS

PATTERSON, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 9

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
CROWS LANDING QUADRANGLE
SHEET NUMBER 10

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

1000 0 1000 2000 3000 4000 5000 6000 7000

FEET

MILES

1	2	3
4		5
6	7	8

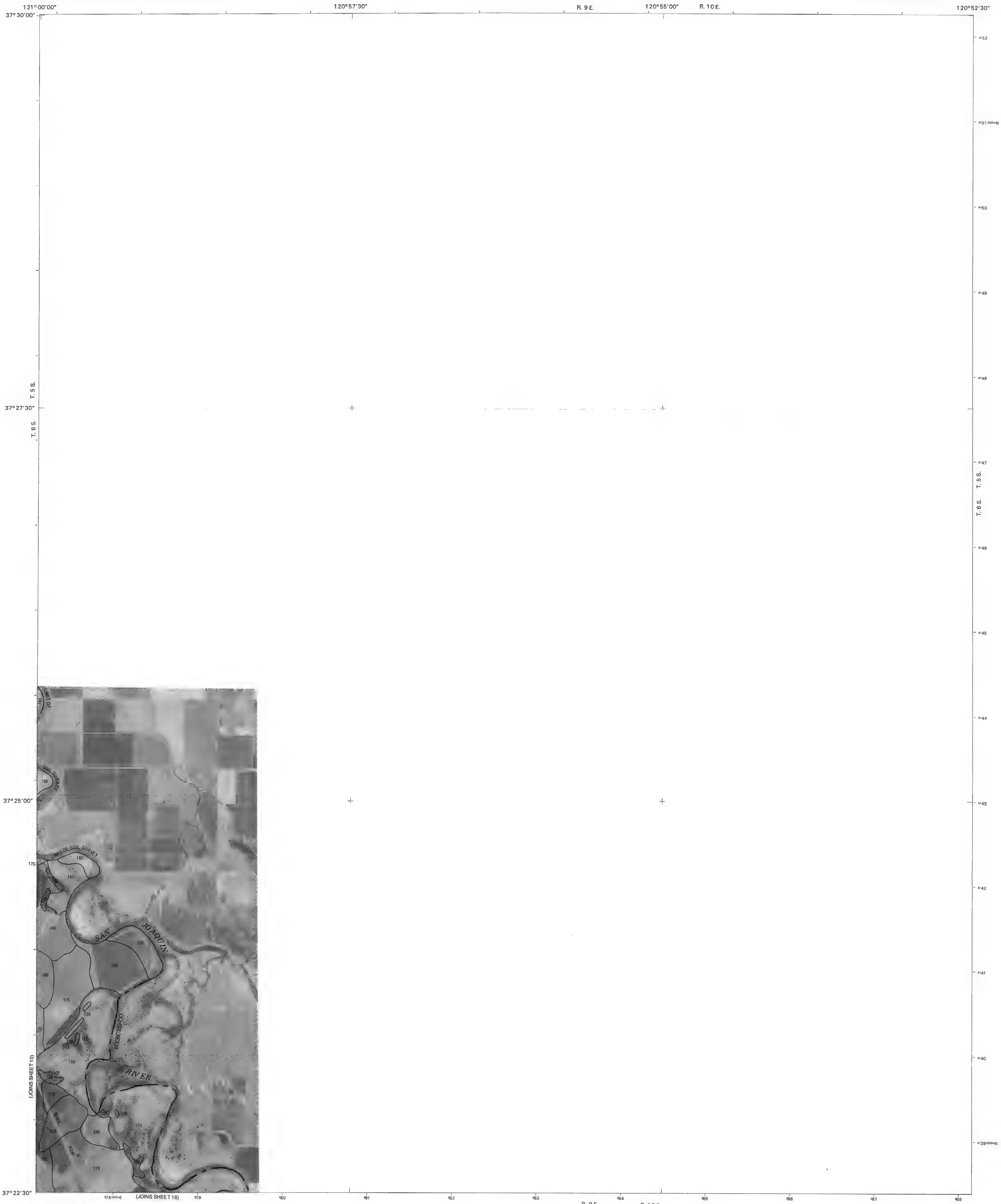
1 WESTLEY
2 BRUSH LAKE
3 CERES
4 PATTERSON
5 HATCH
6 ORESTIMBA PEAK
7 NEWMAN
8 GUSTINE

INDEX TO ADJOINING 7.5 MAPS

CROWS LANDING, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 10

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
HATCH QUADRANGLE
SHEET NUMBER 11



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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

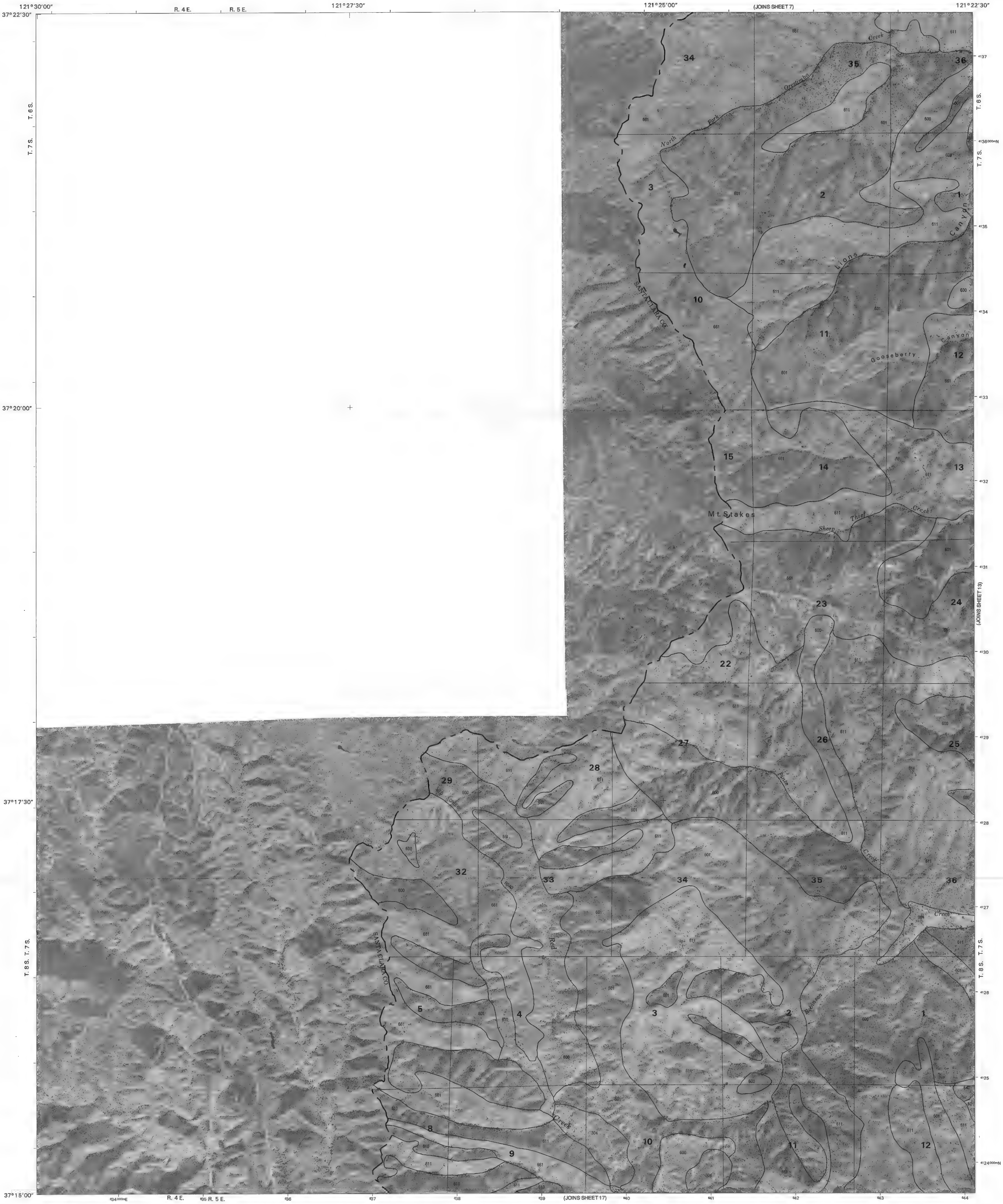
1	2	3	1 BRUSH LAKE 2 CERES 3 DENAIR
4		5	4 CROWS LANDING 5 TURLOCK
6	7	8	6 NEWMAN 7 GUSTINE 8 STEVINSON

INDEX TO ADJOINING 7.5 MAPS

HATCH, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 11

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
MOUNT STAKES QUADRANGLE
SHEET NUMBER 12



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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

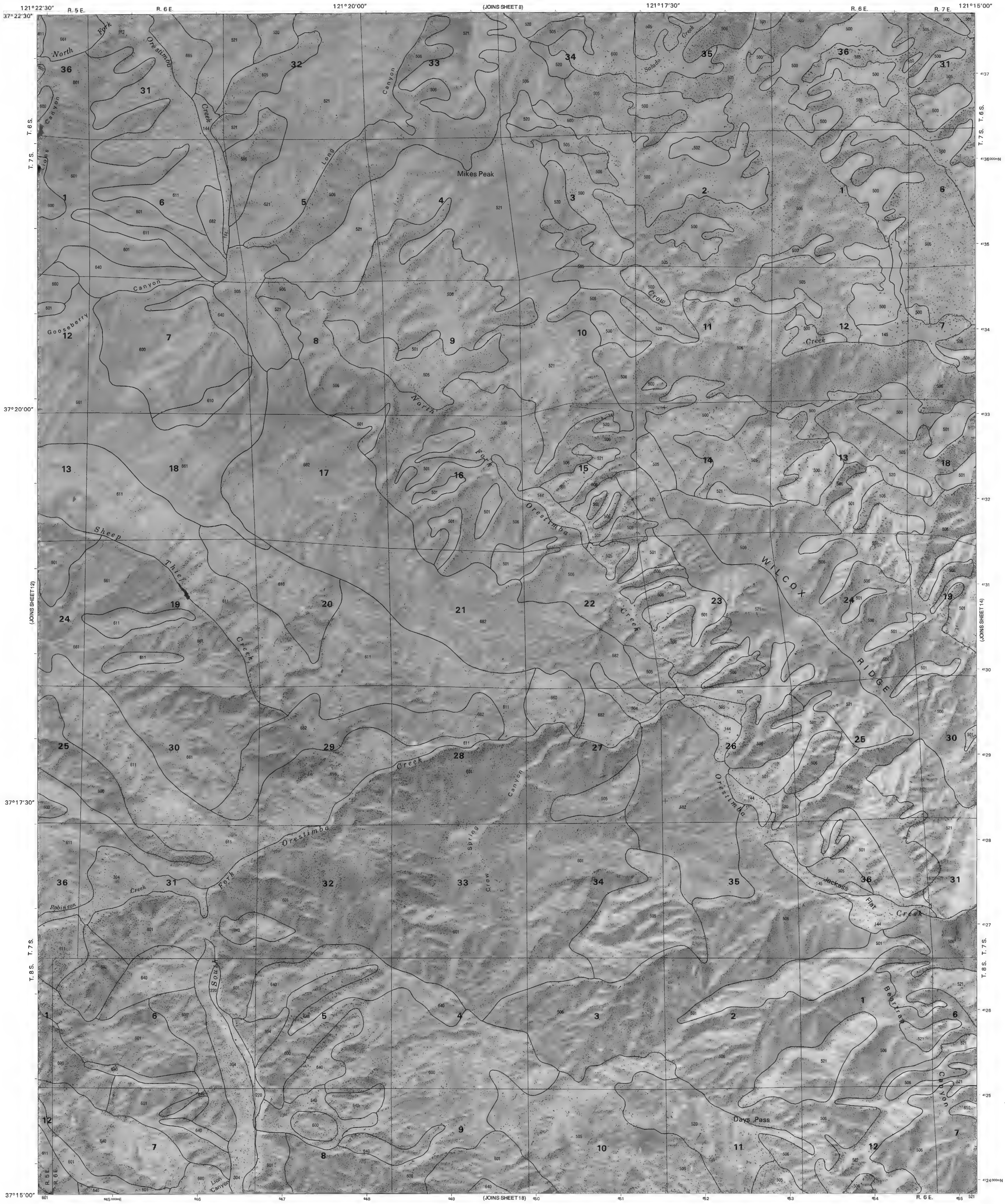
1	2	3
4		5
6	7	8

1 EYLAR MOUNTAIN
2 MOUNT BOARDMAN
3 COPPER MOUNTAIN
4 ISABEL VALLEY
5 WILCOX RIDGE
6 MOUNT SIZER
7 MISSISSIPPI CREEK
8 MUSTANG PEAK

INDEX TO ADJOINING 7.5 MAPS

MOUNT STAKES, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 12

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



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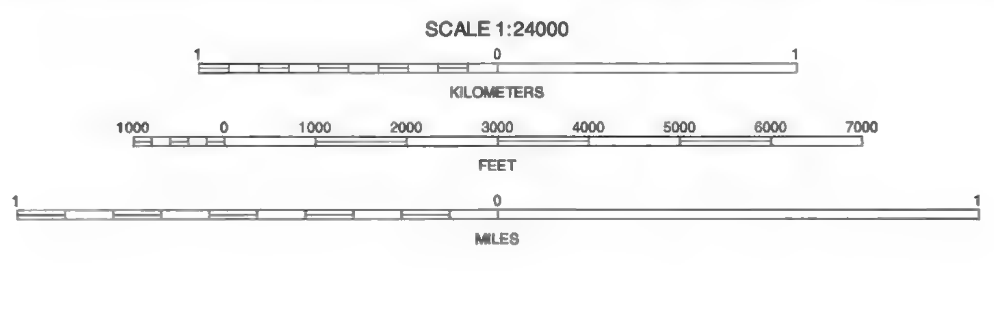
North American Datum of 1927 (NAD27). Clarke 1866 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 10. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION



1	2	3
4		5
6	7	8

1 MOUNT BOARDMAN
2 COPPER MOUNTAIN
3 PATTERSON
4 MOUNT STAKES
5 ORESTIMBA PEAK
6 MISSISSIPPI CREEK
7 MUSTANG PEAK
8 CREVISON PEAK

INDEX TO ADJOINING 7.5 MAPS

WILCOX RIDGE, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 13

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
ORESTIMBA PEAK QUADRANGLE
SHEET NUMBER 14

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1970 aerial photography. Hydrography and culture information were acquired from U.S. Geological Survey data; therefore, some features may not align exactly with base imagery.

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1 COPPER MOUNTAIN
2 PATTERSON
3 CROWS LANDING
4 WILCOX RIDGE
5 NEWMAN
6 MUSTANG PEAK
7 CREVISON PEAK
8 HOWARD RANCH

INDEX TO ADJOINING 7.5 MAPS

ORESTIMBA PEAK, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 14

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
NEWMAN QUADRANGLE
SHEET NUMBER 15

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North American Datum of 1927 (NAD27). Clarke 1866 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 10. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1	2	3
4		5
6	7	8

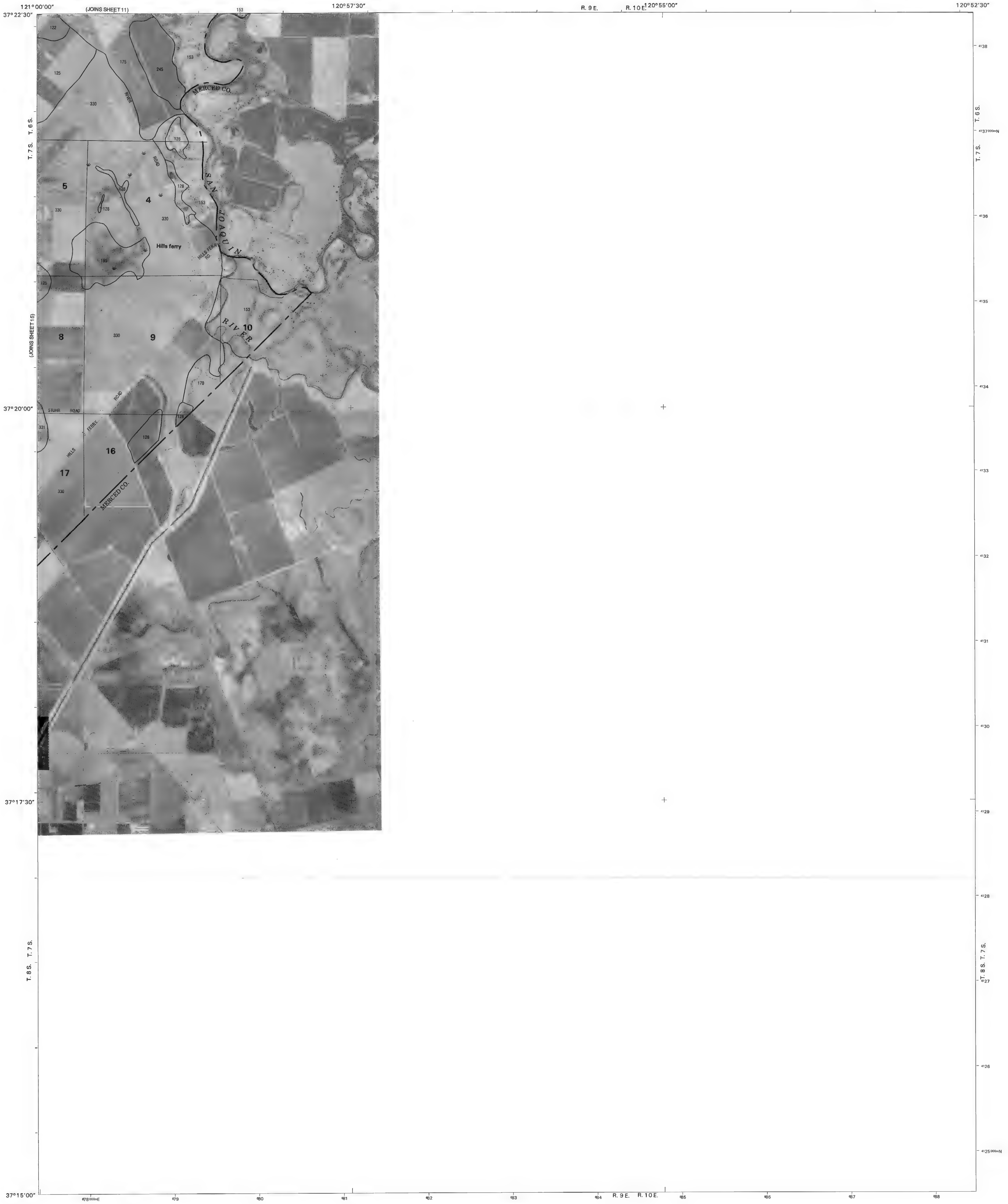
1 PATTERSON
2 CROWS LANDING
3 HATCH
4 ORESTIMBA PEAK
5 GUSTINE
6 CREVISON PEAK
7 HOWARD RANCH
8 INGOMAR

INDEX TO ADJOINING 7.5 MAPS

NEWMAN, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 15

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
GUSTINE QUADRANGLE
SHEET NUMBER 16



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North American Datum of 1927 (NAD27). Clarke 1866 Spheriod
1000-meter ticks: Universal Transverse Mercator, zone 10.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

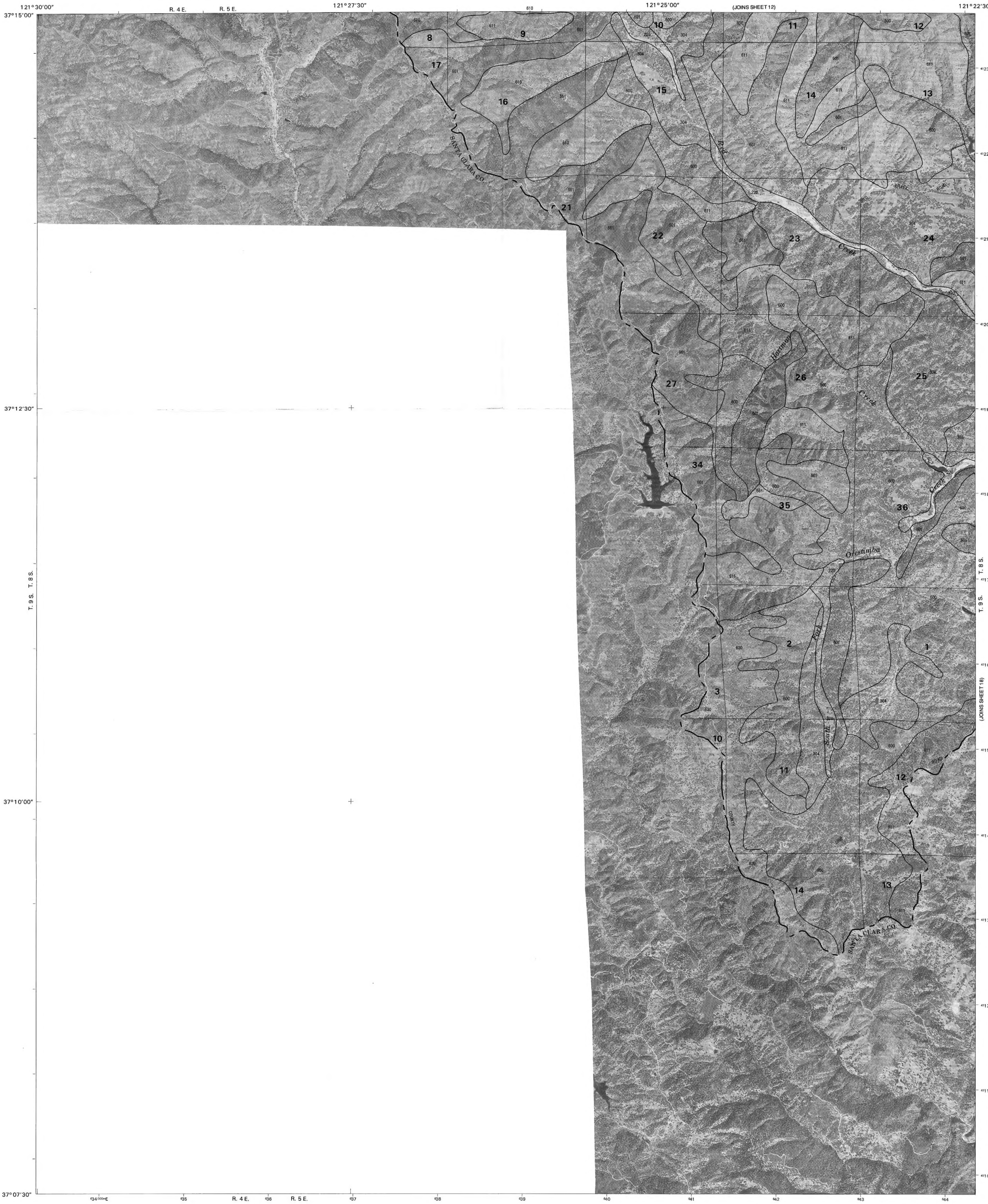
1 CROWS LANDING
2 HATCH
3 TURLOCK
4 NEWMAN
5 STEVINSON
6 HOWARD RANCH
7 INGOMAR
8 SAN LUIS RANCH

INDEX TO ADJOINING 7.5 MAPS

GUSTINE, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 16

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
MISSISSIPPI CREEK QUADRANGLE
SHEET NUMBER 17



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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
KILOMETERS

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
MILES

1	2	3
4		5
6	7	8

1 ISABEL VALLEY
2 MOUNT STAKES
3 WILCOX RIDGE
4 MOUNT SIZER
5 MUSTANG PEAK
6 GILROY
7 GILROY HOT SPRINGS
8 PACHECO PEAK

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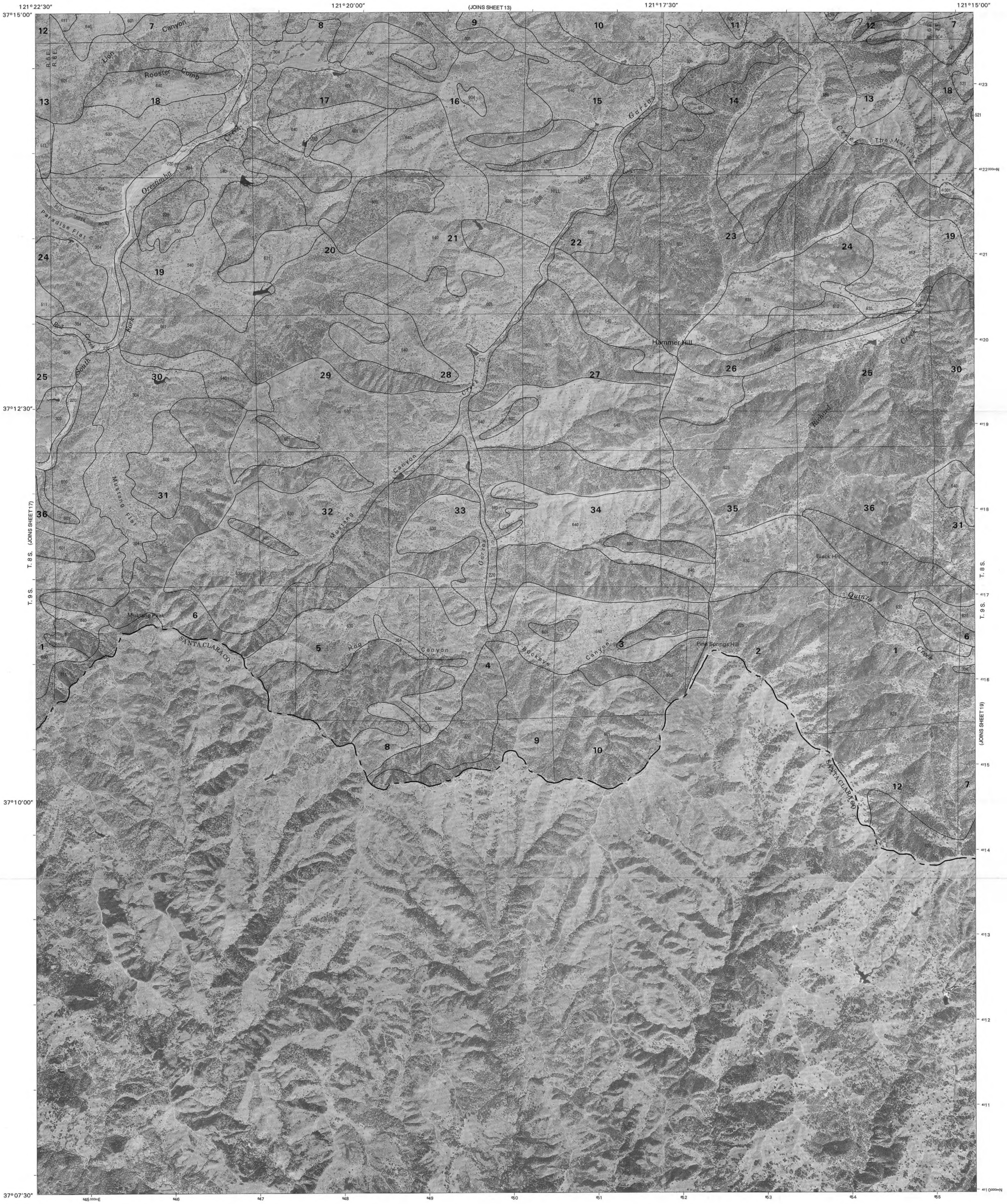
MISSISSIPPI CREEK, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 17

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
MUSTANG PEAK QUADRANGLE
SHEET NUMBER 18



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North American Datum of 1927 (NAD27). Clarke 1866 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 10. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1	2	3
4		5
6	7	8

1 MOUNT STAKES
2 WILCOX RIDGE
3 ORESTIMBA PEAK
4 MISSISSIPPI CREEK
5 CREVISON PEAK
6 GILROY HOT SPRINGS
7 PACHECO PEAK
8 PACHECO PASS

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MUSTANG PEAK, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
CREVISON PEAK QUADRANGLE
SHEET NUMBER 19

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1970 aerial photography. Hydrography and culture information were acquired from U.S. Geological Survey data; therefore, some features may not align exactly with base imagery.

North American Datum of 1927 (NAD27). Clarke 1866 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 10. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

KILOMETERS

FEET

MILES

1	2	3
4		5
6	7	8

1 WILCOX RIDGE
2 ORESTIMBA PEAK
3 NEWMAN
4 MUSTANG PEAK
5 HOWARD RANCH
6 PACHECO PEAK
7 PACHECO PASS
8 SAN LUIS DAM

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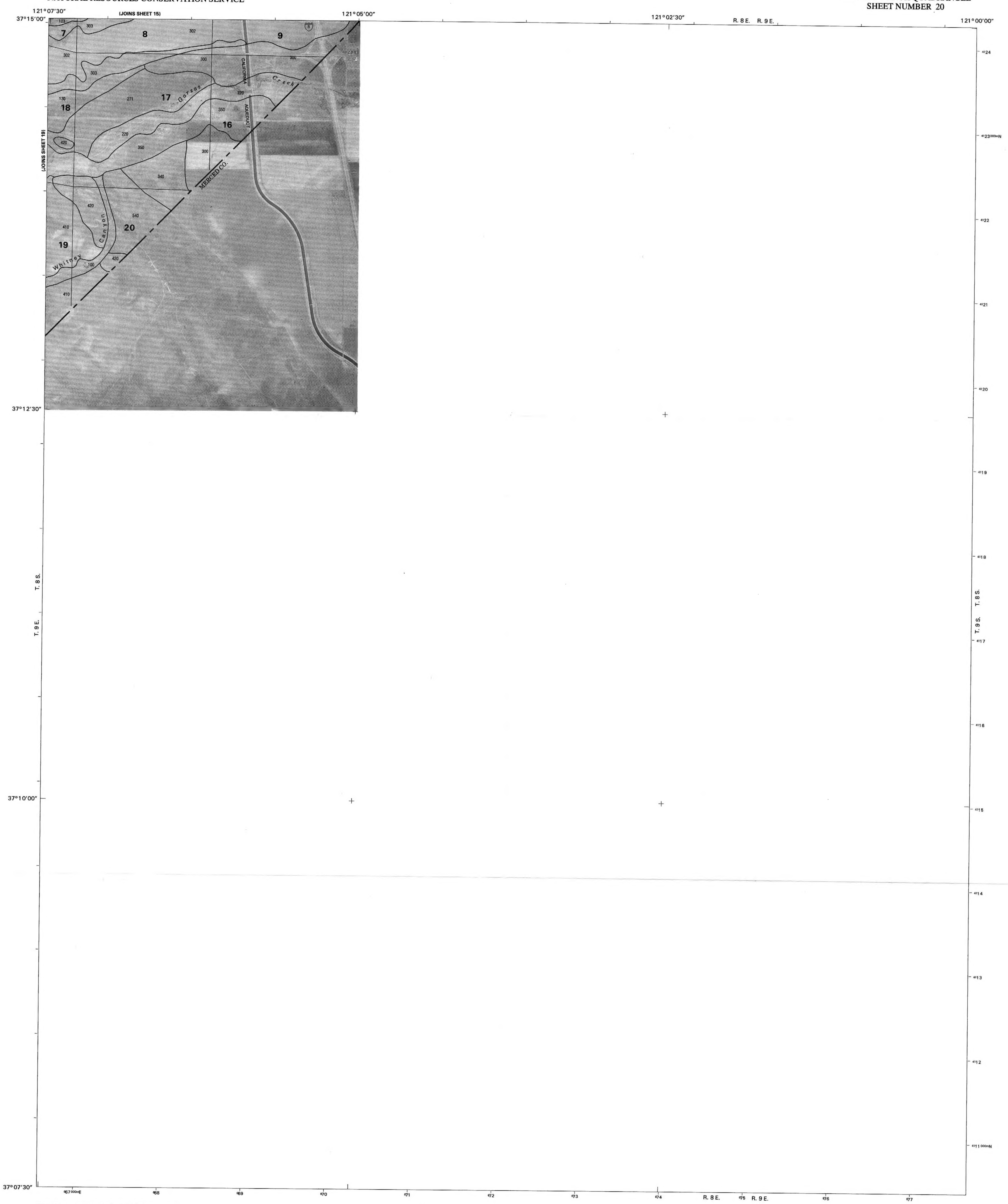
CREVISON PEAK, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 19

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

STANISLAUS COUNTY, CALIFORNIA, WESTERN PART
HOWARD RANCH QUADRANGLE
SHEET NUMBER 20



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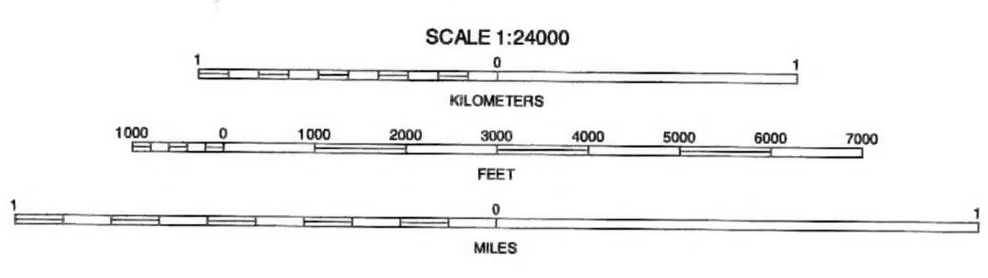

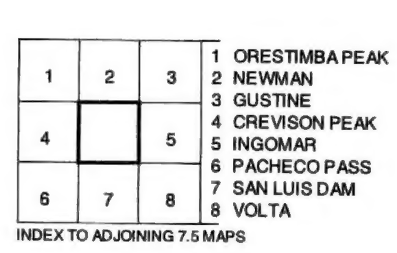

HOWARD RANCH, CALIFORNIA
7.5 MINUTE SERIES
SHEET NUMBER 20